ESSAYS ON INTRA-INDUSTRY SPILLOVERS FROM FDI IN DEVELOPING COUNTRIES

A Firm-Level Analysis with a Focus on Sub-Saharan Africa

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ESSAYS OVER INTRA-BEDRIJFSTAK SPILLOVER-EFFECTEN VAN DIRECTE BUITENLANDSE INVESTERINGEN IN ONTWIKKELINGSLANDEN

EEN ANALYSE VAN BEDRIJFSGEGEVENS, IN HET BIJZONDER GERICHT OP AFRIKA BEZUIDEN DE SAHARA

Thesis

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To my parents:
Afewerki Demena and Leteyesus Niguse
To my wife and daughter:
Ghenet Araya and Gelila Binyam

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Acronyms

AC	Absorptive Capacity
AAYE	Association of African Young Economist
AUC	African Union Commission
CDA	Clustered Data Analysis
DANS	Data Archiving and Networked Services
EconLit	Economics Literature Index Database
EGT	Endogenous Growth Theory
FDI	Foreign Direct Investment
FAT	Funnel Asymmetry Test
GETS	General-to-Specific
GDP	Gross Domestic Product
IOT	Industrial Organization Theory
ISIC	International Standard Industrial Classification
ISI	Institute of Scientific Information
IMF	International Monetary Fund
LP	Levinsohn-Petrin
LCU	Local Currency Units
MB	Marginal Benefit
MC	Marginal Cost
MAER-Net	Meta-Analysis in Economics Research Network
MRA	Meta-Regression Analysis
MRM	Meta-Regression Model
MST	Meta-Significance Test

WLS	Weighted Least Squares
MEM	Mixed-Effects Multilevel Model
MNC	Multinational Corporation
ODA	Official Development Assistant
OLI	Ownership Location and Internalization
OLS	Ordinary Least Squares
OP	Olley-Pakes
OECD	Organization for Economic Cooperation and Development
PET	Precision-Effect Test
R&D	Research and Development
SSA	Sub-Saharan Africa
SDGs	Sustainable Development Goals
TFP	Total Factor Productivity
UBOS	Ugandan Bureau of Statistics
UIA	Ugandan Investment Authority
UIRI	Uganda Industrial Research Institute
UNCST	Uganda National Council for Science and Technology
UN	United Nations
UNECA	United Nations Economic Commission for Africa
UNCTAD	United Nation Conference on Trade and Development
VG	Veblen-Gerschenkron

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Abstract

Foreign Direct Investment (FDI) is widely associated with potential spillover benefits leading to productivity gains in host countries. The argument is that when foreign firms invest in a host country they not only invest capital, they often also transfer proprietary knowledge to their subsidiaries. With the expectation that host country firms would be able to benefit from this knowledge transfer, many developing countries introduced policies that encourage FDI via a range of incentives. However, the resulting empirical evidence on the actual spillovers is sobering.

Over the past three decades, an impressive number of empirical studies have investigated the intra-industry productivity spillovers from FDI. We have systematically reviewed these large numbers of empirical studies carried out in developing countries and published up to an including 2013. This review provides 1,545 estimates of spillover parameters from 74 studies conducted by 96 researchers, dealing with 31 developing countries. About one-third of the reported estimates find a positive and significant spillover effect, whereas one in six shows a negative and significant spillover effect. The other 51 per cent report both positive and negative but insignificant effects. Hence, despite the huge literature concerned in investigating the intra-industry productivity spillover effects and the policy relevance in promoting FDI, findings in the reported empirical studies are not conclusive. Set against this backdrop, an important first general objective of this thesis is to investigate whether FDI actually generates spillovers in the context of developing countries. It approaches this by using a meta-analysis to combine, summarize and investigate the reported estimates of spillover parameters.

Theoretically, the literature recognizes that the presence of FDI may positively affect the productivity of local firms as it results in skilled labour turnovers, it demonstrates the feasibility of new technologies and exerts competitive pressure to improve local efficiency. These are the three fundamental transmission mechanisms for intra-industry productivity spillovers. However, these spillover channels are not explicitly considered in the reported empirical

studies. None of the existing studies offered a complete picture of the spillover effects in terms of the channels under which they are assumed to occur. In other words, each of the existing empirical studies provided a partial picture focusing on one aspect of the spillover effect. This implies that these studies use a fairly narrow framework. This is an important omission since the sign, size and significance of spillover effects can vary according to the transmission channels. Owing to this gap between theoretical considerations and empirical analyses, the second general objective of this thesis is to provide a more complete description of the intra-industry spillover effects through which they are expected to take place. Moreover, the workings of the transmission channels in turn require a separation of host country firms in terms of their technological level, absorptive capacity and the geographical proximity of domestic firms to foreign firms. We approach this objective by using firm-level quantitative and qualitative data from sub-Saharan Africa (SSA) industries.

To achieve these general objectives, the thesis presents four interrelated empirical studies to:

i. *investigate whether the FDI spillovers literature suffers from publication bias, and if so, to what extent;*

ii. *estimate the size of the spillover effect - whether FDI has a significant spillover effect and the sign of this spillover effect - and whether it is positive or negative;*

iii. *examine and understand the determinants behind the heterogeneity of the findings reported in the primary empirical studies;*

iv. *investigate the FDI intra-industry spillover effects with respect to the channels through which the effects are expected to emerge;*

v. *examine whether, how and to what extent firm-level heterogeneity influences the FDI spillover transmission channels;*

vi. *explore how geographical proximity between foreign and domestic firms influences the workings of the channels; and*

vii. *enquire whether majority foreign-owned firms versus minority foreign-owned firms affect the workings of the channels differently.*

The analyses provided for the first general objective (i.e., to investigate whether FDI actually generates spillovers in the context of developing countries) show that the reported intra-industry FDI productivity spillover effects do indeed suffer from publication bias, indicating that the reported size of the empirical effect appears to be substantially larger than is actually the case. After controlling for publication bias and misspecification in the primary studies, the size of the genuine underlying meta-effect remains economically and statistically significant. However, because of the publication bias and mis-

specification in the primary studies, the weighted uncorrected average reported spillover estimates exaggerated the genuine underlying meta-effect by about 44 per cent. In spite of the robust overall positive underlying spillover effect, there is also substantial heterogeneity in the reported spillover estimates. The sign and size of the reported spillover effects depend systematically on two major sources of heterogeneity, i.e., specification choices and publication bias, but is also influenced by estimation choices and data characteristics. Results also indicate that publication bias is not caused by the choices in line with 'best practice' or by the preference of journal reviewers and editors but largely by the favourable treatment by researchers of the primary studies for positive and statistically significant findings.

After examining the mixed results reported in the primary empirical studies, the thesis goes on to investigate the transmission channels through the inclusion of previously omitted spillover channels. This is potentially important, in order to accurately describe and identify the impact of spillover processes that possibly narrow the heterogeneity in reported spillover estimates and to guide host countries towards relevant transmission channels. The empirical results from a panel of eight SSA countries demonstrate the empirical relevance of distinguishing the aforementioned three channels: First, imitation-determined spillovers are found to be absorbed by all types of firms except low technology firms. Second, competition-determined spillovers are captured by SSA firms with a high absorptive capacity. Third, labour mobility-determined spillovers are experienced only by firms in the low technology group. Fourth, majority foreign-owned firms within the host economies enhance the workings of the knowledge spillover effects, whereas minority foreign-owned firms stimulate the competitive spillover effects. Last, the effect of geographical proximity or concentration enhances the magnitude of spillover effects and influences the workings of the transmission channels, but mainly via enhancing imitation effects and reducing the existence of negative competition effects. Furthermore, the magnitude of imitation effect is softened and the gains from movement of workers vanish altogether with exports. The non-linear spillover effects analysis points to declining (vanishing) spillover benefits after an increase in FDI penetration goes past a certain point.

In addition to these empirical approaches, the fieldwork in Uganda provided qualitative data (i.e., structured interviews, expert interviews and observations). A somewhat deeper examination of each type of spillover transmission channel through various on-site semi-structured interviews conducted with Ugandan and foreign firms provided a slightly more comprehensive and detailed description of the workings of the channels using the hypotheses

formulated in the econometric approach. The evidence demonstrates that an empirical inquiry into spillover impacts is a challenging research topic. This is because both negative and positive spillover effects occur simultaneously. This inquiry also shows that long-term pecuniary spillover effects are predominantly stimulated via the competition channel, whereas both short-term and long-term technological spillover effects occur through the imitation and the movement of workers channels. These channels, however, are not only less prevalent but also appear to be constrained by the presence of local competition. Furthermore, Ugandan firms in the sample also experienced a loss of market share and local workers to foreign firms.

The overall findings of the thesis lead to the conclusion that the realty of intra-industry FDI spillover effect supports theories that predict significant positive productivity benefits. The evidence challenges the single spillover channel approach, and indicates the importance of a somewhat deeper and more detailed analysis which considers each spillover channel to identify how spillover effects actually emerge. Accordingly, this thesis offers both a fuller and more nuanced picture of spillover effects from FDI.

Essays over intra-bedrijfstak spillover-effecten van directe buitenlandse investeringen in ontwikkelingslanden

Een analyse van bedrijfsgegevens, in het bijzonder gericht op Afrika bezuiden de Sahara

Samenvatting

Directe buitenlandse investeringen (Foreign Direct Investment of FDI) worden veelal geassocieerd met potentiële spillover-effecten die leiden tot een productiviteitstoename in gastlanden. De redenering hierachter is dat buitenlandse bedrijven niet alleen kapitaal investeren in een gastland, maar vaak ook gespecialiseerde kennis overdragen aan hun dochterondernemingen. In de verwachting dat bedrijven in het gastland zouden kunnen profiteren van deze kennisoverdracht, hebben veel ontwikkelingslanden beleidsmaatregelen genomen om FDI op verschillende manieren te stimuleren. Empirische gegevens over de daadwerkelijke spillover-effecten geven echter aanleiding tot een nadere analyse.

De laatste dertig jaar is er veel onderzoek gedaan naar productiviteitstoename binnen een sector als gevolg van FDI. Dit onderzoek biedt een systematisch literatuuroverzicht van de vele tot en met 2013 gepubliceerde empirische studies die zijn uitgevoerd in ontwikkelingslanden. Het onderzoek behelst 1545 schattingen van spillover-coëfficiënten op basis van 74 studies door 96 onderzoekers, uitgevoerd in 31 ontwikkelingslanden. Ongeveer een derde van de gerapporteerde schattingen wijst op een positief en significant spillover-effect, terwijl een op de zes schattingen een negatief en significant spillover-effect laten zien. De overige schattingen (51 procent) betreffen zowel positieve als negatieve, maar niet significante effecten. Ondanks de omvangrijke literatuur op het gebied van de spillover-effecten op de productiviteit binnen de sector en de beleidsrelevantie van dit onderwerp, zijn de resultaten van de empirische studies niet eensluidend. Een belangrijk eerste algemeen doel van dit proefschrift is daarom om te onderzoeken of FDI metterdaad spillover-effecten oplevert in ontwikkelingslanden. Hiertoe is een meta-analyse gedaan om de gerapporteerde schattingen van spillover-coëfficiënten te combineren, samen te vatten en te onderzoeken.

Theoretisch kan FDI een positief effect hebben op de productiviteit van lokale bedrijven, omdat FDI leidt tot de overdracht van geschoolde arbeid, de uitvoerbaarheid en het belang van nieuwe technologieën aantoont, en door concurrentiedruk de lokale doelmatigheid verbetert. Dit zijn de drie fundamentele mechanismen voor spillover-effecten op productiviteit binnen een sector. Deze spillover-kanalen worden echter niet expliciet in aanmerking genomen in de gerapporteerde empirische studies. Geen van de bestaande studies biedt een compleet beeld van de spillover-effecten of de mechanismen die er theoretisch achter liggen. Elke empirische studie biedt met andere woorden een gedeeltelijk beeld dat gebaseerd is op één aspect van het spillover-effect. Dit betekent dat deze studies een beperkend kader hanteren. Dit is belangrijk, omdat de richting, grootte en het belang van spillover-effecten kan variëren afhankelijk van het transmissiekanaal. Gezien deze kloof tussen theorie en empirische analyses, is het tweede algemene doel van dit proefschrift om een volledigere beschrijving te bieden van de spillover-effecten binnen een sector en van de mechanismen waardoor spill-over effecten kunnen optreden. Daarnaast moeten bedrijven in het gastland nader worden onderscheiden naar technologisch niveau, absorptiecapaciteit en de geografische afstand tussen binnenlandse en buitenlandse bedrijven. Voor dit deel van het onderzoek is gebruikgemaakt van kwantitatieve en kwalitatieve data op bedrijfsniveau uit sectoren in Afrika bezuiden de Sahara (SSA).

In het proefschrift worden vier onderling gerelateerde empirische studies beschreven. Deze zijn uitgevoerd om:

i. *te onderzoeken of er in de literatuur over FDI-spillovers sprake is van publicatievertekening en zo ja, in welke mate;*

ii. *de grootte van het spillover-effect te schatten; of het spillover-effect van FDI significant is en wat de richting is van dit spillover-effect – positief of negatief;*

iii. *te onderzoeken en begrijpen hoe de heterogeniteit van de resultaten van de primaire empirische studies te verklaren is;*

iv. *de FDI-spillover-effecten binnen een sector te onderzoeken met betrekking tot de kanalen waarlangs de effecten zich naar verwachting manifesteren;*

v. *te onderzoeken of, hoe en in welke mate heterogeniteit op bedrijfsniveau van invloed is op de transmissiekanalen voor FDI-spillover;*

vi. *na te gaan in hoeverre geografische nabijheid tussen buitenlandse en binnenlandse bedrijven van invloed is op de verschillende kanalen; en*

vii. *na te gaan of het belang en de invloed van de drie kanalen anders is voor bedrijven die voor het grootste deel in buitenlandse handen zijn dan voor bedrijven die voor minder dan de helft in buitenlandse handen zijn.*

Het eerste deel van dit onderzoek heeft tot doel om te onderzoeken of FDI metterdaad spillover-effecten oplevert in ontwikkelingslanden. Uit de resultaten blijkt dat in het onderzoek naar de FDI-spillover-effecten op de productiviteit binnen een sector inderdaad sprake is van publicatievertekening. Concreet wordt gevonden dat het in de primaire studies gerapporteerde effect substantieel groter is dan in werkelijkheid. Na correctie voor publicatievertekening en misspecificatie in de primaire studies blijft de grootte van het werkelijke onderliggende meta-effect economisch en statistisch significant. Vanwege de publicatievertekening en misspecificatie in de primaire studies blijken de gewogen ongecorrigeerde gemiddelde schattingen van de spillover-coëfficiënten echter ongeveer 44 procent hoger dan het werkelijke onderliggende meta-effect. Ondanks het robuuste algemene positieve onderliggende spillover-effect is er ook sprake van substantiële heterogeniteit in de gerapporteerde schattingen van de spillover-effecten. De richting en grootte van de gerapporteerde spillover-effecten wordt systematisch bepaald door twee belangrijke bronnen van heterogeniteit, namelijk specificatiekeuzes en publicatievertekening, maar wordt ook beïnvloed door schattingskeuzes en kenmerken van de data. De resultaten wijzen er ook op dat publicatievertekening niet veroorzaakt wordt door keuzes op grond van *best practice* of door de voorkeur van reviewers en redacteuren van wetenschappelijke tijdschriften, maar vooral door onderzoekers die een voorkeur hebben voor positieve en statistisch significante resultaten.

Na de analyse van de gemengde resultaten van de primaire empirische studies volgt het tweede deel van het proefschrift. Hierin zijn de transmissiekanalen onderzocht door de in de eerdere literatuur grotendeels genegeerde mechanismen achter productiviteits-spillover mee te nemen. Dit is belangrijk om de invloed van spillover-processen die de heterogeniteit in de gerapporteerde schattingen van spillover mogelijk beperken nauwkeurig te kunnen beschrijven en ontdekken, en om gastlanden de weg te wijzen naar relevante transmissiekanalen.

De resultaten van een panel van acht SSA-landen wijzen op de empirische relevantie van het meenemen van eerdergenoemde drie kanalen als een van de mogelijk verklarende variabelen. Ten eerste komen op imitatie gebaseerde spillovers voor in alle typen bedrijven behalve laagtechnologische bedrijven. Ten tweede krijgen SSA-bedrijven met een hoge opnamecapaciteit te maken met op concurrentie gebaseerde spillovers. Ten derde komen op arbeidsmobiliteit gebaseerde spillovers uitsluitend voor bij laagtechnologische bedrijven. Ten vierde versterken bedrijven die voor het grootste deel in buitenlandse handen zijn binnen de economieën van het gastland de spillover van kennis, terwijl bedrijven die voor minder dan de helft in buitenlandse handen zijn de

concurrentie spillover-effecten stimuleren. Ten slotte vergroot geografische nabijheid of concentratie de spillover-effecten en dit is in onderscheiden mate van invloed op de transmissiekanalen. Belangrijk is hierbij vooral het versterken van imitatie-effecten en verminderen van negatieve concurrentie-effecten. Verder wordt het imitatie-effect getemperd en verdwijnen de voordelen van mobiliteit van werknemers geheel indien bedrijven exporteren. De analyse van niet-lineaire spillover-effecten wijst op afnemende spillover-voordelen nadat een toename van FDI een bepaald niveau bereikt heeft.

In aanvulling op deze empirische benaderingen zijn met veldonderzoek in Oeganda kwalitatieve data verzameld met behulp van gestructureerde interviews, interviews met experts en door eigen observatie. De verschillende typen transmissiekanalen voor spillover zijn nader geanalyseerd door middel van verschillende semi-gestructureerde interviews met Oegandese en buitenlandse bedrijven. Dit leverde een volledigere en gedetailleerdere beschrijving op van het functioneren van de kanalen op basis van de hypotheses die zijn geformuleerd ten behoeve van de econometrische benadering. De resultaten laten zien dat empirisch onderzoek naar spillover-effecten een uitdagend onderzoeksonderwerp is. Hierbij is van belang dat zowel negatieve als positieve spillover-effecten tegelijkertijd optreden. Uit dit promotieonderzoek blijkt ook dat langetermijneffecten bij financiële spillovers hoofdzakelijk bevorderd worden door het concurrentiekanaal, terwijl zowel korte- als langetermijneffecten bij technologische spillover optreden via de imitatie- en arbeidsmobiliteitskanalen. Deze kanalen zijn echter niet alleen minder gangbaar, maar lijken ook belemmerd te worden door de aanwezigheid van lokale concurrentie. Daarnaast kregen Oegandese bedrijven in de steekproef ook te maken met verlies van marktaandeel en lokaal personeel aan buitenlandse bedrijven.

Op grond van de onderzoeksresultaten kan geconcludeerd worden dat FDI in de praktijk spillover-effecten binnen een sector teweegbrengt die conform de theoretische voorspellingen leiden tot een significante productiviteitstoename. De resultaten zijn in tegenspraak met de benadering van één enkel transmissiekanaal, en wijzen op het belang van een wat diepgaandere en gedetailleerdere analyse van ieder transmissiekanaal op zich om te ontdekken hoe spillover-effecten precies ontstaan. Daarmee biedt dit proefschrift een vollediger en tevens genuanceerder beeld van spillover-effecten door FDI.

1 Introduction

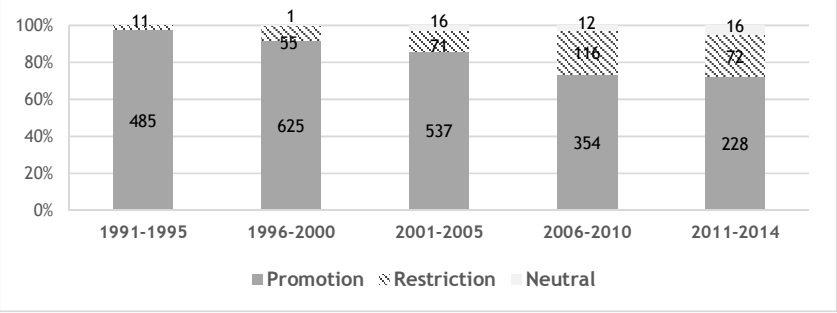
1.1 Background

Since the 1980s, in many developing countries foreign direct investment (FDI) has been a major priority for policy-makers. FDI is not only important as a source of external macroeconomic finance, but also and especially for the productivity spillover effects that it generates for the local economy operating through imitation, labour turnover and competition (e.g., see Fan, 2002; Hoekman and Javorcik, 2006; UNECA, 2012). Spillover effects from FDI are generally assumed to emerge when the production level or efficiency of the host country's firms are influenced by or benefit from the entry and operation of foreign affiliates and the latter are not able to fully internalize the value of these gains (Blomström and Kokko, 1998; Fan, 2002; Jordaan, 2012; Kokko, 1992; 1994).

The focus of this thesis is on intra-industry spillover effects from FDI which are expected to emerge through the three aforementioned transmission channels. First, the imitation or demonstration channel arises when foreign firms demonstrate the feasibility or enable the imitation of new technologies in the local market. Second, the worker mobility channel operates through local workers who have worked for or were trained by foreign firms enhancing the productivity of domestic firms they go on to work for (i.e., by either moving to an existing domestic firm or by setting up a new local firm). Third, the competition channel works through an increase in competitive pressure as the presence of foreign firms[1] may force domestic firms to improve their efficiency by using existing technology and resources more efficiently or even by adopting new technology. The literature recognizes the first two as the knowledge spillover effects and the third as the allocative efficiency spillover effect of FDI.

Because of these spillover effects, many developing countries actively seek to facilitate FDI by providing tax breaks or subsidies, by enforcing the patent regime and other investment incentives (e.g., see Hamida, 2007; Hoekman and Javorcik, 2006; UNECA, 2012). Host countries have a set favourable policies to accelerate FDI inflows using measures to influence national investment policies. The outcomes of the national investment policy changes can be categorized as promotional, regulatory or neutral. As illustrated in Figure 1.1, about 2,599 changes in investment policies related to FDI were introduced between 1991 and 2014 by at least 102 countries. Overall, about 86 per cent of the policy changes support favourable conditions for inward FDI, whereas 12 per cent support regulations or restrictions on investment. Clearly then, policy measures focused on investment are principally directed towards the promotion and facilitation of FDI inflows.

Figure 1.1
Number & percentage of changes in national investment policies: 1991-2014

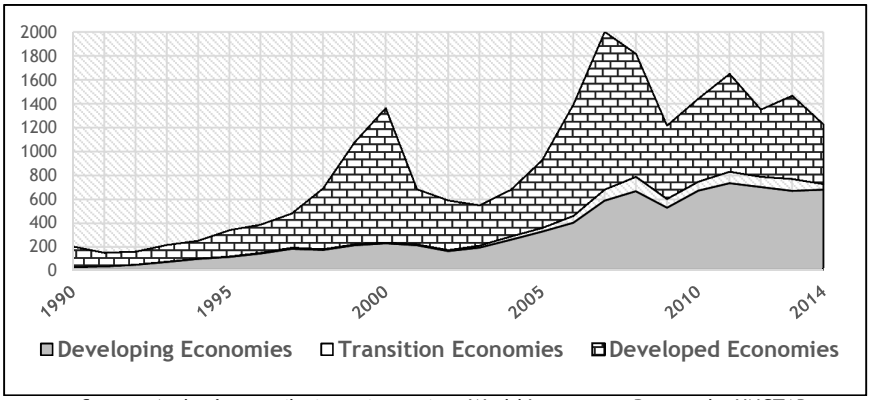


Source: Author's compilation using various World Investment Reports by UNCTAD.

Recently, the importance of FDI and the related spillover effects was re-emphasized through two major global development events in 2015: the Global Summit on Post-2015 Development Agenda in September 25 and the third International Conference on Financing for Development in July. These two major events have ushered in new global agendas and identified how these should be implemented (UNECA et al., 2015). The former event provides a global framework for achieving 17 Sustainable Development Goals (SDGs), and the latter introduces implementation policy guidelines.[2]

Through the participating members[3], the International Conference on Financing identifies several action areas that provide a strong foundation for achieving the SDGs. One of the seven action areas is domestic and international private business and finance (United Nations, 2015a). In this action area, the private sector is viewed as a major driver for sustainable and inclusive economic growth, job creation, productivity, innovation, and industrialization. In this regard, FDI in particular is important as a policy guideline for implementation of SDGs as it strengthens FDI-related spill-overs (United Nations, 2015a; 2015b). In terms of development, FDI remains an important source of finance for most developing countries with which to bring in know-how and technology (Buckley et al., 2007b; Hamida, 2013; UNECA and AUC, 2011). In this regard, Member States of developing countries recognize FDI as a vital component of their development efforts (e.g., see United Nations, 2015a; 2015b; 2010).

Figure 1.2
FDI inflows by group of economies in US dollars in billions (1990 -2014) [a]



Source: Author's compilation using various World Investment Reports by UNCTAD.
[a] All FDI figures are US dollars at current prices and current exchange rates in billions.

Consistent with the changes in policy measures in favour of inward FDI, Figure 1.2 shows that there has been a significant increase in FDI flows in the past two decades. Globally, FDI stood at US$ 59 billion in 1980 (UNCTAD, 1994) and grew to slightly more than US$ 200 billion in 1990 (Figure 1.2). FDI significantly increased in 2000 to US$ 1,363 billion and reached a new record high in 2007 of slightly more than US$ 2,000

billion, which surpassed the record set in 2000 by 32 per cent. After four years of uninterrupted flows (i.e., from 2003 to 2007), globally FDI flows experienced a drop of about 10 per cent in 2008. This is mainly because of the slowdown in the developed economies as a result of the crisis that began in September 2007 and that made investment opportunities and access to finance unattractive and difficult (UNCTAD, 2010). The first episode of the crisis thus immediately bit into global FDI inflows in 2008. With the second episode of the crisis that began in September 2008, in 2009 FDI flows continued to plummet at an accelerated rate, i.e. about 39 per cent of the historical pick of global FDI flows.

As shown in Figure 1.2, in developing countries FDI flows continued to grow in the face of the first episode of the crisis, and reached their highest level ever in 2008. Although the crisis affected global FDI flows significantly, developing economies showed more resilience because these countries were less closely integrated with the financial system of the developed countries where the crisis originated (Bhattacharya and Dasgupta, 2012). However, the FDI flows of developing countries fell with the deepening of the second episode of the crisis. For the first time in about a decade, shrinking demand for exports and lower commodity prices made new FDI flows to these countries less attractive (UNCTAD, 2009).

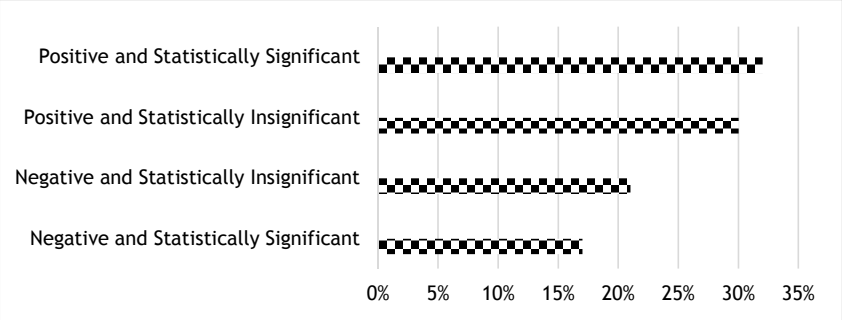
Global FDI reached its highest point of about US$ 2 trillion in 2007; about two-thirds of this was contributed by developed countries. After 2007 global FDI shrank due to a continuous drop in the share of FDI into developed countries. The marked decrease in FDI in developed countries is seen in contrast to the case in developing countries. For instance, in 2012, FDI to developed countries shrank to about 43 per cent (US$ 561 billion) of its peak value in 2007 (US$ 1,320 billion), whereas developing countries absorbed 20 per cent (US$ 142 billion) more than developed countries in that year. In other words, developing countries accounted for mre than a 50 per cent share of the total FDI inflow in 2012, their highest share ever. It appears that the regional FDI inflow showed a gradual reversal of the global share. For instance, in 2007, the global share of FDI for developing and developed countries was 29 per cent and 65 per cent, respectively, whereas in 2012 the former accounted for about 52 per cent. This shift in the FDI landscape continued to grow, favouring developing countries. In 2014, global FDI fell mainly due to a continuous decline to developed countries. Developed and developing countries accounted for US$ 499 billion and US$ 681 billion FDI respectively in that year with

developing countries absorbing a record share of 55 per cent of the global FDI. In general, FDI in developing countries appears to be relatively more stable, leading the recovery and accounting for the majority global share.

1.2 Motivation

The substantial increase in FDI penetration in developing countries has led to a burgeoning of empirical studies seeking to investigate productivity spillovers as a result of FDI in a given sector (represented as intra-industry productivity spillovers). However, the actual evidence for productivity spillovers associated with FDI has yielded substantial controversy and, hence, is far from conclusive.

Figure 1.3
Spillover effects from FDI reported in 74 studies (1983-2013)



Source: Author's compilation from 1,545 estimates of spillover parameters.

We have reviewed the large numbers of published and unpublished empirical studies carried out in developing countries in the period 1983 - 2013. This review has identified 1,545 reported spillover estimates from 74 empirical studies conducted by 96 researchers, dealing with 31 developing countries[4]. Figure 1.3 gives the extent of disagreement in terms of the direction and significance of the reported effects. About one-third of the estimates find a positive and significant spillover effect, whereas one in six reports a negative and significant spillover effect. The other 51 per cent show both positive and negative but insignificant effects. Hence, despite the huge literature concerned with investigating the intra-sector productivity spillover effects, as well as the policy relevance in promoting

FDI, findings in the empirical studies have generated substantially divergent results (see also Demena and van Bergeijk, 2017b). An important first general motivation of this thesis is, therefore, to investigate whether FDI actually generates productivity spillovers in the context of developing countries.

We use a meta-analysis approach to combine, summarize and investigate the reported 1,545 estimates of spillover parameters. Meta-analysis is a useful statistical approach to investigate the mixed results routinely found in reported empirical studies investigating a similar hypothesis, research question, or empirical effect (Stanley and Doucouliagos, 2012). This methodology is already well recognized and generally accepted in medical science and psychology, but is increasingly also providing significant contributions in the social sciences (De Groot et al., 2007). To date, five relevant meta-analyses of FDI spillovers have been published: Görg and Strobl (2001), Meyer and Sinani (2009), Wooster and Diebel (2010), Iršová and Havránek (2013) and Mebratie and van Bergeijk (2013). In all these meta-analyses, the methodological approach in specifying the primary empirical studies to be analyzed involved personal judgement and self-selection bias and thus their findings may potentially be misleading. Against this backdrop, we collected all available and accessible empirical studies that have investigated intra-sector productivity spillovers from FDI for developing countries. In this regard, we consider the current meta-analysis to be a more comprehensive version of the previous meta-analyses. This potentially leads to a better stability and reliability of the findings. It also helps to examine whether a self-selection bias of studies has an impact on bias; a topic so far not researched.

Accordingly, the first empirical part of the thesis aims to:

i. investigate whether the FDI productivity spillovers literature suffers from publication bias, and if so, to what extent;

ii. estimate the size of the spillover effect - whether FDI has a significant spillover effect and the sign of this spillover effect - and whether it is positive or negative; and

iii. examine and understand the determinants behind the heterogeneity of the findings reported in the primary empirical studies.

Further, as presented by the Meta-Analysis in Economics Research Network (MAER-Net)[5], the thesis aims to demonstrate how to follow the

reporting guidelines when conducting meta-analysis in order to improve transparency and increase their quality.[6] We focus on developing countries as the expected occurrences of spillover effects in developed countries are more likely to differ from those in developing countries (Aitken et al., 1996; Glass and Saggi, 2002; Haddad and Harrison, 1993). Indeed, Wooster and Diebel (2010) argue that pooling reported empirical estimates from developed and developing countries is inappropriate.

It is important to recognize from the start that none of the reported empirical studies provides a complete picture of the intra-sector FDI productivity spillover effects according to the channels through which they are assumed to occur. Each of the empirical studies offers a partial picture focusing on one aspect of the spillover effect or channel. The reported spillover estimates are measured using the share of foreign presence in the industry. This variable seems to capture only the imitation-determined spillover channel (Kokko, 1996; Tian, 2007). Indeed, the theoretical model by Wang and Blomström (1992) suggests that spillovers from competition are not necessarily determined by the extent of FDI presence alone, but rather largely by the interaction between domestic and foreign firms. In this regard, existing studies have failed to capture much of the competition-determined spillover channel and the worker mobility-determined spillover channel (Hamida, 2013). This is a potentially important omission since the occurrence, sign and size of spillover effects can vary with respect to the transmission channels. Thus, there is a wide gap between theoretical considerations and empirical analyses.

Another important omission is that most of the studies attempted to test the hypothesis of a relationship between FDI and productivity spillover regardless of the nature of firm-level heterogeneity. The empirical design of the 74 studies reviewed recognizes the importance of the input factors and their qualities in a production function framework, but fails to include some important firm-level heterogeneity factors. Table 1.1 can explain this, providing variables related to firm-level heterogeneity included in the empirical design of the studies under review and the corresponding spillover effects. For instance, the studies largely ignore the heterogeneity characteristics related to the absorptive capacity and the technological levels of domestic firms, as only 10 per cent of the regressions control for these differences, a point already stressed by Mebratie and van Bergeijk (2013) regarding absorptive capacity. In this case, about two out of three of the regressions show the importance of technological levels. Thus, the

characteristics of domestic firms cannot be ignored, but rather, seem to mediate the expected magnitude, significance and sign of the spillover effects. That is, the extent to which spillovers emerge may not appear evenly across all firms.

Table 1.1
Firm-level heterogeneity and FDI spillover effects

Variable	*Positive & Significant at 10%*		*Insignificant at 10%*		*Negative & significant at 10%*		*Total No.*
	No.	*%*	*No.*	*%*	*No.*	*%*	
Firm size	160	29	269	50	112	21	541
Export	110	38	159	55	21	7	290
Technological gap	57	36	59	39	40	25	156
Absorptive capacity	41	28	84	56	24	16	149

Source: FDI spillover effects reported in 74 studies published in 1983-2013 (N=1545).

In light of the above, the second general motivation of this thesis is to offer a better description of the intra-industry productivity spillover effects in terms of how they occur. In this case, our empirical strategy recognizes that the FDI spillover effects should not be interpreted simply as a single foreign share presence. Rather, it requires identifying the FDI spillover transmission channels to investigate the occurrence, sign and magnitude of the spillover effects. Accordingly, the second empirical part of the thesis aims to:

i. investigate the FDI intra-industry productivity spillover effects with respect to the channels through which the effects are expected to emerge;

ii. examine whether, how and to what extent firm-level heterogeneity influences the FDI spillover transmission channels;

iii. explore how geographical proximity between foreign and domestic firms influences the workings of the channels; and

iv. enquire whether majority foreign-owned firms versus minority foreign-owned firms affect the workings of the channels differently.

In this part, we focus on sub-Saharan Africa (SSA) countries. The reason is that SSA appeared to be highly under-represented in the reported empirical investigation provided by the 96 researchers. In line with the

first motivation of the thesis, this part also deals with the research questions across SSA countries and thus avoids the problem of country bias as the case is in most studies that focus on a single country setting.

1.3 Data

The first empirical part of the thesis relies on data collected from all accessible existing primary empirical studies. We follow the MAER-Net protocol as prescribed in the *Journal of Economic Surveys* (2013) Vol. 27, No. 2. We identified our relevant primary studies via an extensive search of various sources. The search included all relevant published and unpublished English language empirical studies from 1983 to 2013 inclusive. After examination of the abstract, introduction and conclusion of each of the studies, the search yielded a gross list of 233 prospective primary empirical studies. Following the imposition of the specified protocols for inclusion and exclusion of the studies, we ended up with 74 studies for coding and data construction.[7]

For this project, we coded potential theoretical and empirical research dimensions and journal qualities. A template of data extraction was designed in Microsoft Excel. Using this template, 131,325 cells were manually filled. The data coding involved a second independent reviewer to check the consistency of the data. Ultimately, the dataset comprises 1,450 observations from 69 primary studies for which the required data parameters are available. The reason for this somewhat lower number of primary studies is that we had to exclude 95 reported estimates (five studies) as the authors of the primary studies were either unable or unwilling to provide the required missing or additional data.

The second empirical part of the thesis relies on both quantitative and qualitative data. The quantitative data were obtained from the World Bank's Enterprise Surveys. The Enterprise Surveys use the same sampling approach to represent a sample of representative firms in the formal non-agricultural private sector using three levels of stratification: firm size, geographical region and industry. This allows us to examine the research questions across SSA countries and thus avoid potential risk associated with country bias, as is often the case in a study in a single country setting. Based on data availability, this thesis uses a firm-level panel dataset from eight SSA countries spanning the period 2006–2014. These surveys contain information on a host of individual variables, including ownership

status, productivity performance, technological behaviour and a range of other firm characteristics. The surveys are comprised of firm-level information for 8,801 firms (3,632 in the first survey and 5,169 in in the second survey). The panel dataset is restricted to 1,580 domestic and foreign firms, of which about 85 per cent are local firms.

The qualitative data were obtained via fieldwork in Uganda (one of the eight SSA countries where a panel dataset was already available). This data was collected from on-site, semi-structured interviews with 33 Ugandan and foreign firms in 2015, expert interviews with Ugandan officials, and document analysis. In addition, we compiled secondary quantitative data from the Uganda Investment Authority (UIA).[8]

1.4 Approach

In this section, a detailed description of the contents of the thesis is presented. Following this Introduction, the thesis is organized into three parts.

The first part presents a theoretical review of FDI spillover effects. First, we present a working definition of FDI and FDI spillovers. Then, we identify and discuss three strands of theoretical literature on modelling spillovers from FDI under which spillover effects are assumed to emerge. The earliest strand assumes that the FDI spillover effect is automatic, suggesting that spillover effects are determined by the presence of FDI in the industry alone. In the second strand, FDI spillover effects are seen as costly and not automatic, suggesting that FDI alone cannot yield the benefits expected by the first strand. Instead, this strand considers the endogenous spillovers that emerge from the technological competition between foreign and local firms. The third, most recent, strand considers spillovers to take place via the mobility of workers.

It is important to recognize from the start that none of these strands provides a theoretical model that describes the complete picture of spillover effects. Each of the theoretical models offers a partial picture focusing on one aspect of the spillover effect. Therefore, we present a formwork that considers the combination of the three strands of spillovers with the aim of better understanding and describing more comprehensively the potential spillover effects from FDI. Finally, in line with recent theoretical contributions, we allow the nature of the spillover effects to vary according to firm-level heterogeneity as well as geographical proximity.

The second and third parts of the thesis present an empirical examination of the intra-sector FDI spillover effects as outlined in the thesis motivation. The second part consists of two empirical chapters, i.e., Chapters 3 and 4, using a meta-analysis approach to investigate the issue of publication bias and the controversy in the reported mixed results, as well as to provide guidelines as to how carefully the empirical approach of spillover effects should be designed, importantly for the third part of this thesis.

We believe that meta-analysis has three important tasks. The first task is to examine the issue of publication bias. Begg and Berlin (1988:421) argue, '[m]any other commentators have addressed the issue of publication bias… All agree that it is a serious problem …' For instance, if researchers hide negative results in their desk drawers, the simple average can bias the literature upward. According to Havránek and Iršová (2013), in the literature of spillover effects, for instance, until the 1990s, statistically significant positive spillover effects formed a relatively common consensus. This might result in the 'desk drawer' problem for results showing negative spillovers or may provide insight into the prior beliefs that guide empirical researches. Subsequently, many empirical economics research began to pay more attention to addressing the presence of publication bias (e.g., see Görg and Strobl, 2001; Iršová and Havránek 2013; Lazzaroni and van Bergeijk, 2014; Stanley, 2005, 2008; Stanley and Doucouliagos, 2012).

Hence, it is important to investigate whether the literature suffers from publication bias, and if so, to what extent. In this regard, Chapter 3 investigates publication bias of FDI spillover effects in developing countries using a meta-analytical approach. Part of this investigation, was published in the *Journal of Applied Economics Letters* (Demena, 2015). Most importantly, this chapter offers insights into whether a genuine underlying empirical effect and the determinants behind the mixed results reported in the primary studies go beyond the identification of publication bias as presented in Chapter 4. This will take us to the other two tasks of meta-analysis: namely, to establish the underlying genuine effect after controlling for publication bias and misspecification of the primary studies, and to explain the heterogeneity reported in the empirical estimates.

Hence, Chapter 4 goes beyond the identification of publication bias to estimate the underlying genuine spillover effect size and sign as well as to explain the heterogeneity. This Chapter was previously published in the *Journal of Economic Surveys* (Demena and van Bergeijk, 2017a). The chapter emphasizes that the application of meta-analysis in examining empirical

findings from divers primary studies can offer useful insights for theory positions and predict 'best practice' to improve the research design of future primary studies. The results of best practice should emphasize filtering out publication bias, reducing omitted variable bias and controlling endogeneity aspects from the primary studies under review. Importantly, this part of the thesis lays the groundwork for the subsequent chapters by providing ideas on how to investigate the nature and occurrence of spillover that may not be identified by simply reviewing individual primary empirical studies. This will take us to the third part of the thesis.

The third part offers empirical evidence of the theoretical model outlined in Chapter 2, using both quantitative and qualitative data from SSA countries. This part consists of two empirical chapters. Chapter 5 investigates the transmission channels of FDI spillover effects in order to identify the channels for the occurrence, sign and magnitude of spillover effects. It also investigates the workings of the transmission channels that vary with respect to absorptive capacity, the technological levels of domestic firms and the geographical proximity between foreign and domestic firms. Furthermore, this chapter seeks to investigate whether the workings of the channels vary with respect to majority foreign-owned firms versus minority foreign-owned foreign firms.

Chapter 6 offers somewhat more in-depth exploration of each type of spillover transmission channel based on the result of various on-site interviews with Ugandan and foreign firms. In this chapter, we observe that the econometric approach outlined in Chapter 5 alone does not allow for a complete and detailed description of the workings of the channels. In this regard, this chapter makes an effort to dig a bit deeper into the pertinence of the hypotheses outlined in Chapter 5. The main motivation of this chapter is to show that an analysis of a qualitative approach is thus far unexplored. In addition, the findings described in Chapter 6 mainly emerged from variables that were obtained from direct responses to questions related to spillover effects as opposed to proxy variables derived from an econometric approach as described in Chapter 5. Hence, the approach in Chapter 6 is an important contribution to this thesis.

At the end of the thesis, the concluding chapter summarizes the key findings, the implications that follow (i.e., six policy recommendations based on the findings) and areas for future empirical research.

Notes

[1] Throughout this thesis, foreign presence or foreign firm refers to the presence of FDI. We use these terms interchangeably.

[2] The 17 SDGs encompass three dimensions: economic, social and environmental. From the economic perspective, SDG numbers eight (promote sustained, inclusive and sustainable economic growth, full productive employment and decent work for all) and nine (build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation) for instance, raise the question of how to define appropriate financial implementation.

[3] This conference hosted participants from 174 countries that includes, 24 Heads of State and Government and their deputies, more than 100 Finance Ministers, Foreign Affairs and Development Cooperation and deputies and other high-ranking Government officials. Other participants in the conference were Heads of major financial, trade and development institutions and senior representatives of UN agencies and other international organizations and more than 600 civil society organizations and networks and 400 representatives of business sectors (UN, 2015a:2).

[4] These are: Argentina, Bangladesh, Bolivia, Cambodia, Chile, Colombia, Ecuador, Ethiopia, Ghana, Guatemala, India, Indonesia, Kenya, Malaysia, Mexico, Morocco, Panama, Paraguay, Peru, Philippine, South Africa, Thailand, Taiwan, Tanzania, Turkey, Uganda, Uruguay, Venezuela, Vietnam, Zambia, and Zimbabwe.

[5] https://www.hendrix.edu/maer-network/ Accessed 08 May 2013.

[6] Specifically our meta-analyses: (1) apply a second independent reviewer; (2) report the list of variables used for the MRA and their descriptive statistics; (3) use funnel plots to display a visual inspection of the effects; (4) employ a GETS modelling approach to simplify the multivariate MRA; (5) examine publication and misspecification biases; (6) accommodate heteroscedasticity and purified within-study dependence; and (7) report robustness tests – via average estimates across studies, peer-reviewed studies, OLS clustered data analysis, excluding estimates from interaction variables, and inclusion of outliers.

[7] The dataset is published and available in the Data Archiving and Networked Services (DANS): Demena, B.A., 2017 Meta-analysis data for spillover effects from FDI: 1986 - 2013', hdl:10411/5OYIDT, *DataverseNL Dataverse,* https://dataverse.nl/dataverse/demena or https://dataverse.nl/dataset.xhtml?persistentId=hdl:10411/5OYIDT).

[8] The rapid rise in FDI in the manufacturing sector, better incentives offered to attract FDI, a favourable business environment for FDI, and its non-resource-based economy motivated us to consider Uganda as an exciting case to study (Colen, 2009; Rasiah, 2009; Riddervold, 2011; UIA, 2015a).

2 Theories explaining intra-industry FDI spillover effects

2.1 Introduction

This chapter provides a theoretical review of FDI spillover effects. We provide a working definition of FDI and FDI spillovers. We identify three strands in the literature which model spillovers from FDI. The earliest strand of theoretical models assumes that the FDI spillover effect is automatic, seeing it as a public good that can be transferred free of charge by increasing the level of foreign presence. In this strand, the effects are determined by the degree of FDI presence alone (contagion-type spillovers). In the second strand, FDI spillover effects are costly and not automatic, suggesting that FDI alone cannot yield the benefits expected of it by the first strand. Rather, the spillover of FDI largely depends on the interaction between domestic and foreign firms in the host country, suggesting that the actual occurrence of spillovers is determined by competition. The third, most recent, strand considers spillovers to take place through the mobility of workers. The local workers that have worked for or were trained by foreign firms are expected to enhance the productivity of the domestic firms they move on to next.

It is important to recognize from the start that none of the existing theoretical models provides a complete picture of the intra-sector FDI spillover effects. Each of the theoretical models offers a partial picture, focusing on one aspect of the spillover effect. Indeed, the strands do not consider the spillover transmission channels simultaneously. This is an important factor, since the occurrence, sign and size of potential spillover effects may vary in line with the channels through which the effects are expected to emerge. Therefore, the combination of the three spillover models strands is discussed with the aim to better understand the potential

for spillover effects. Finally, recent theoretical contributions suggest that the nature of spillover effects also differs according to firm-level heterogeneity and their geographical location. In the appendix, we offer an overview of other FDI effects and discuss the main theoretical literature that explains FDI activities across national boundaries.

This chapter is structured as follows. Section 2.2 discusses the concept of FDI and spillovers. Section 2.3 provides and discusses the main theoretical models of the intra-sector spillovers from FDI. Section 2.4 provides the theoretical framework of this thesis. Section 2.5 sums up the theoretical discussion and we describe the research agenda of FDI intra-sector spillover effects.

2.2 FDI spillovers

In this section, first we will offer a definition of FDI. The International Monetary Fund (IMF) (2014:149) defines FDI as '… a category of cross-border investment associated with a resident in one economy having control or a significant degree of influence on the management of a company that is resident in another economy'.[1] The definition reveals the objective to establish a lasting interest or relationship in an enterprise operating outside of the investor's economy. The lasting interest refers to the existence of a long-term relationship between the enterprise and the direct investor(s) (Organization for Economic Cooperation and Development, OECD, 2008). It also reveals the objective to obtain and be able to exercise control or a significant degree of influence over the enterprise. According to the IMF (2009, 2014) and the OECD (2008), control is determined to exist if ownership of at least 50 per cent is in the hands of the direct investor, whereas a significant degree of influence is determined to exist if ownership of the enterprise is below 50 per cent but at least 10 per cent is in the hands of the direct investor. Hence, FDI is generally is seen as ownership of at least 10 per cent of the equity in an enterprise by a direct investor who provides capital (IMF, 2014; OECD, 2008; World Bank, 2014). The forms of investment by the direct investor(s) classified as FDI are equity capital (the investor's purchase of shares in an enterprise), the reinvestment of earnings (earnings not distributed to investor or foreign affiliates as dividends), and the intra-company short- and long-term loans between parent and affiliate enterprises (OECD, 2008).

Spillovers or externalities[2] are considered a more valuable effect associated with FDI (Blomström and Kokko, 1998; Buckley et al., 2007a; Kokko, 1992; Farole and Winkler, 2014a). As noted in Blomström and Kokko (1998), the most important motive for countries to promote and facilitate FDI is the potential to acquire advanced technology. Technology is interpreted broadly to include product, process, and distribution technology. FDI productivity spillovers or externalities refer to the situation in which the presence and operation of foreign affiliates affects the production level or efficiency of local firms in the host country and the latter do not compensate the former for the productivity or efficiency gains (Blomström and Kokko, 1998; Jordaan, 2012; Kokko, 1992). This expected potential productivity spillover benefit is seen by some as the principal reason for host country governments to promote FDI as it makes up the most important channel for the transfer of technology from foreign affiliates to domestic firms (Buckley et al., 2007b; Hamida, 2013; Kokko, 1992;). The idea of spillover was already recognized in the first half of the last century by Marshall (1930:271), who pointed out the benefits to nearby factories through the importance of '… the advantages which people following the same skilled trade get from near neighbourhood to one another'. In particular, Marshall noted:

> Good work is rightly appreciated, inventions and improvements in machinery, in processes and the general organization of the business have their merits promptly discussed: if one man starts a new idea, it is taken up by others and combined with suggestions of their own; and it becomes the source of further new ideas.

Marshall's idea of spillover or externality is further developed by Viner who divides spillovers into pecuniary and technological. Viner (1931) stated that a pecuniary externality results from changes in prices, while a technological externality is derived from changes in the production processes that are not reflected in prices. Scitovsky (1954), who incorporates the notion of interdependence among firms, further elaborated these concepts of externalities.

In terms of the technological externality, interdependence directly affects the production process through technology adoption. This refers to the uncompensated for flow of knowledge from one firm to another firm that is not captured by the market mechanism (Jordaan, 2012; Smeets, 2008). Technological externalities are considered to occur when '… the

actions of one agent directly affects the environment of another agent, i.e., the effect is not transmitted through price' (Papandreou, 1994:5). Suppose that in a given region there are two firms – F (foreign) and D (domestic). Firm F introduces new technology in the production process. If firm D picks up this new technology and uses in its production process, and assuming that firm F cannot charge firm D for its improvement of the new production process, a positive technological spillover has occurred. This externality is described as a direct or non-market mechanism as firm D learns and uses firm F's knowledge without paying any compensation.

A pecuniary externality, by contrast, arises from indirect interdependence via the market mechanism. Pecuniary externalities are likely to occur '… whenever the profits of one producer are affected by the actions of other producers' (Scitovsky, 1954:146). Assume again the situation of the two firms indicated above, and also consider that firm F is subject to an increasing return on production, implying that a change in the quantity of production will alter firm F's efficiency. This efficiency is also expected to change the price firm D gets from the market and/or has to pay for the input into the production process of the product, and will thereby change its profitability. This implies that a change in the volume of production by firm F (i.e. its action) can affect the level of firm D's efficiency, but the situation of this case is indirectly driven by the market mechanism.

2.3 Intra-industry spillover theoretical models

We identify three strands of theoretical literature that explicitly model the spillover effects from the entry and operation of FDI. The first strand in the theoretical literature assumes that the spillover effect occurs always and automatically. In the second strand, reaping spillover from FDI is costly and FDI is a necessary but not sufficient condition for spillover. The third and most recent strand in the theoretical literature focusses on the mobility of experienced local workers who worked for or were trained by foreign firms and who are expected to move to domestic firms and hence enhance domestic productivity.

2.3.1 Linking spillovers with the extent of foreign presence

In the first literature strand, we identify three theoretical models for spillovers associated with the degree of foreign presence, known as demonstration- or imitation-determined spillovers. These models were described

by Koizumi and Kopecky (1977); Findlay (1978); and Das (1987). Koizumi and Kopecky (1977) were the first to introduce theoretical literature that explicitly models spillover effects from foreign affiliates. Even though researchers like MacDougall (1960), Cokden (1967), and Caves (1971) were early contributors, spillover effects from FDI were not explicitly identified, but rather incorporated in the investigation of the direct and indirect effects associated with FDI.

Koizumi and Kopecky (1977), using a partial equilibrium approach, consider a framework of FDI that brings superior technical expertise into the host country. Specifically, FDI brings foreign entrepreneurs with technical skills that are different from the technical expertise developed by locals. New ideas or superior technical skills introduced with FDI can be transferred to locals through observation. Koizumi and Kopecky (1977:45) analyse '…the role of technological transfers in an international capital movement model by assuming that these transfers depend on the extent of foreign ownership of a country's capital stock'. More specifically, they explicitly introduce the role of technology transfer by treating capital owned by FDI as a proxy for the foreign technical expertise received by the host country. The transfer of technical knowledge through FDI is viewed as a spillover and it is assumed to increase with the proportion or the extent of FDI in the host country. Consequently, spillover is regarded as an automatic and '… a public good which residents can consume, but for which they are not required to pay' (Koizumi and Kopecky, 1977:49).

Secondly in this strand, Findlay (1978) constructs a dynamic model that analyses the relationship between the technological change in a relatively backward country (i.e., a host country) and FDI from a technologically advanced region. This model is based on the idea associated with the transfer of technology proposed by Veblen (1915), followed by Gerschenkron (1962) and also later revisited by Abramovitz (1986). This transfer of technology assumes that faster technological catch-up is achieved when the relative development level disparity between advanced and backward country is large. Recognizing this, Findlay (1978:2) posits that:

> … the rate of technological progress in a relatively backward region is an increasing function of the gap between its own level of technology and that of the advanced region which improves at a constant rate, and the degree to which it is open to direct foreign investment, measured by the proportion of foreign capital operating in the backward region to domestic capital in that region.

In this regard, he emphasizes that given a certain amount of FDI, the larger the technological gap between domestic and foreign firms, the larger the spillover benefits will be. Following Arrow (1971), Findlay also considers the diffusion of technology using the analogy of the spread of a contagious disease. The argument here is that technology is most effectively diffused when there is personal contact between those who bring technological know-how and the people in the host country.

Third, the standard price-leadership model of the oligopoly theory used by Das (1987) tries to analyse the process of technology transfer as taking place in two phases. First, the transfer of technology from the parent company in the home country to its subsidiary in the host country. Second, the transfer of technology as an externality from the subsidiary to domestic firms in the host country. Das assumes that the foreign firm acts as a price leader in the local market and that the local firms create a competitive fringe around it. He treats the increase in the efficiency by local firms as costless and as an exogenous variable. He also assumes that the rate of increase in the efficiency level of local firms is in proportion to the increasing level of activity by the foreign firms. The greater the scale of the operation of foreign firms, the higher the potential for local firms to learn. This positive relationship, as well as the treatment of the contagion idea, is in line with Koizumi and Kopecky (1977) and Findlay (1978). In all of the above three explicit spillover models, the process of imitation and learning by locals becomes an important source of an externality from FDI activities in the host market.

In contrast to Koizumi and Kopecky (1977) and Findlay (1978), Das (1987) also models the cost incurred by 'learning from watching' by local firms. Das examines how this learning from watching influences the behaviour of the foreign firm. He models a choice faced by the foreign firms between the importance of importing superior technology from a parent company from abroad and the costs associated with learning by the local firms due to technological leakage. The price set by the foreign firm in the host market is higher in the absence of learning by the local firms. In this case (i.e., in the absence of learning from watching), he found that the foreign firm benefited. However, in time, the output and profits of the foreign firm decrease, whereas those of the local firms increase as the latter gain spillovers unambiguously (i.e., via learning from watching). Das further found that despite the losses due to the success of the local firms

through learning, it is still worthwhile for the foreign firm to import superior technology to increase its profit level and market share. Hence, foreign affiliates are aware of technology leakage to local firms and determine the level of their import of technology based on this awareness. In the process of importing better technology, Das concluded that the more superior the technology imported by foreign affiliates, the higher the spillover benefits. However, he does not explicitly consider the behaviour of local firms.[3]

2.3.2 Linking spillovers with competition

A major contribution to this strand is by Wang and Blomström (1992). They develop a differential game model of endogenous spillovers that emerge from technological competition between foreign and local firms. This type of spillover is known as a competition-determined spillover. Wang and Blomström (1992) explicitly recognize two types of costs, namely, the costs incurred by foreign affiliates in transferring advanced technology to their subsidiary and the learning costs by local firms.

Wang and Blomström assume the existence of two firms, a domestic firm and a foreign firm that compete with each other, each producing differentiated products for the local market. Accessibility to superior production technology is the main difference between these two. The foreign firm's parent company provides advanced technology to its subsidiary, but the transfer of this technology to its subsidiary is not free. This conclusion is based on Teece (1976), suggesting that there is a commitment of resources and a sequence of stages of activities in international technology transfer that are not too different from the research and development (R&D) activities themselves. For the domestic firm, Wang and Blomström (1992:140) assume there is no free copying of technology, '[s]earching for information, reversed engineering, personnel training for new production methods, …, make learning costly and time consuming. How much resources should be devoted to learning is, therefore, essentially an investment decision'.

The technology transfer works as follows: For the foreign firm, the speed of transfer is directly related to the commitments and resources devoted by a foreign subsidiary to the import of technology from the parent firm. For the domestic firm, its technological level is also an increasing function of its learning investment and its return diminishes as the learning effort scales up. In the latter case, Wang and Blomström also incorporate

Findlay's (1978) theoretical assumption that technological progress by the domestic firm increases in relation to the technological gap between the two kinds of firms. The foreign and domestic product price is also related to the technological gap between these two firms. The price of the foreign firm's products moves in the same direction as the technological gap, whereas the domestic firm's moves in opposite direction. In this case, as technology is transferred from the parent firm, the technology gap increases, but later, due to the learning efforts of the domestic firm, it starts to decline. Recognizing the two types of costs and the strategic interaction between foreign and domestic firms, competition between the two firms is represented by what is called the Cournot game: that is, both firms decide on the optimal production quantities that will help them to maximize profit given their technological know-how.

Wang and Blomström (1992) conclude that the rate at which domestic firms learn to use more modern foreign technology affects the rate at which foreign firms introduce new technology as they try to maintain their technological superiority. Thus both foreign and domestic firms are responsive to the level of the technological gap. This is because the speed of advanced technology transfer through FDI first depends on the actions taken by the local firm. In this context, the higher the investment made by the local firm in learning transferred technologies, the narrower the technology gap will be. Next, in response to this narrower technology gap, the foreign firm allocates further resources to bring in more superior technologies in order to maintain its profitability. This again stimulates further efforts by the local firm to assimilate advanced technology and thus narrow the technology gap. In general, technology transfer via FDI is positively related to the level of domestic firms' investment in learning transferred technologies.

The strategic interaction between foreign affiliates and host country firms, therefore, leads to a 'virtuous circle': domestic firms devote efforts to assimilate the advanced technology of foreign affiliates. This narrows the technological gap between the two firms. In response to this, foreign firms continue to transfer superior technology in order to maintain their technological advantage and thus their business profitability. New superior technology brings further assimilation efforts by domestic firms. In this process, competition-determined spillover effects tend to propel the rate of technology transfer from abroad. Accordingly, Wang and Blomström (1992) suggest that host countries introduce policy measures aimed

at accelerating the domestic firms' efficiency in learning transferred advanced technologies as this tends to speed up the transfer of advanced technologies by foreign affiliates. In other words, policies aimed at making domestic firms more competitive in relation to foreign firms is more likely to generate spillover gains.

2.3.3 Linking spillovers with worker mobility

In the third and most recent theoretical strand, potential spillovers are linked with the knowledge and experience embedded in the human capital of local workers working for or being trained by foreign affiliates. These local workers are expected to move on to local firms and thereby enhance the productivity of these firms. This type of spillover is known as worker mobility-determined spillover. Three theoretical models for this spillover type will be presented: Kaufmann (1997); Fosfuri et al. (2001); and Glass and Saggi (2002).

Kaufmann (1997) argues that two aspects of the spillover process in the Wang and Blomström (1992) model received little attention. The first aspect is the movement of information from foreign firms to domestic firms. Here, Kaufmann (1997) argues that information can be transmitted through the recruitment of local workers who worked or were trained by foreign affiliates. Note that this is also not incorporated in the first spillover strand. The second aspect relates to the actions of foreign affiliates to limit potential spillover benefits. Wang and Blomström, and also speculative thinkers of the first strand, suggest that foreign affiliates are not likely to protect their technological advantages. Kaufmann, on the other hand, argues that if they did, they might be able to benefit more as they might then able to change the virtuous circle that is supposed to emerge as a result of the competition-determined spillovers.

Kaufmann therefore uses an endogenous spillover framework, such as the competition-determined spillovers, to explicitly model the movement of information and the resources employed to influence technological position.[4] Kaufmann examines a partial equilibrium model in a single local product market where there are two players in the leader-follower format as described in a Stackelberg game[5]. In this context, the foreign firm is the leader, the domestic firm is the follower as the setting focuses on spillovers that can emerge only through the transfer of advanced technology from parent company to its subsidiary, and access to the transferred technology

is only possibly by recruiting more employees who previously worked for the foreign firm. The domestic firm's technological capacity is seen as an exogenous parameter that can vary across industries.

Two key results emerge from Kaufmann

i. Spillovers may either emerge or be frustrated in the game between the domestic firms and foreign counterparts. The outcome largely depends on whether the marginal benefits (MR) to the domestic firm of recruitment are smaller or greater than its marginal costs (MC). The MC are determined by the wages paid by the foreign affiliates, whereas the MB depend on the technological capabilities and the demand parameters. A higher wage at the foreign firm raises the marginal costs of recruitment by domestic firms or hinders recruitment altogether. For a given level of recruitment, a higher domestic firm technological capability suggests that the domestic firm can utilize foreign technology more efficiently so that domestic output expands. Larger demand shocks will also promote recruitment to increase output. Consequently, the potential for spillover benefits increases: the lower the foreign firm's wages (MC), the higher the technological capabilities of domestic firms, or the higher the demand shocks (MB).

ii. When spillovers have emerged, foreign affiliates transfer less technology and domestic market prices are higher. As a result, the spillover effect in the host country is generally ambiguous. This result differs from previous spillover theoretical strands (e.g., Wang and Blomström, 1992) in which the existence of spillovers accelerates the transfer of technology by foreign affiliates in an effort to maintain their technological superiority. In contrast, Kaufmann (1997) has argued that foreign affiliates tend to transfer less technology in an attempt to protect downward pressure on prices, and thus spillovers impose costs on domestic firms in terms of limited access to advanced foreign technology.

Kaufmann's first result supports Wang and Blomström's (1992) finding that improving the technological capabilities of domestic firms accelerates potential spillover benefits. In this context, policies aimed at promoting the competitiveness of domestic firms are more likely to increase the potential for spillover gains. Similarly, Kaufmann (1997) has argued that his current theoretical model is stronger in that enhancing domestic firms'

technological capabilities tends to shift the local market from no spillovers to a spillover equilibrium. However, in his second result, the occurrence of spillovers may force foreign counterparts to transfer less technology, and hence foreign investment may not improve host country welfare. Accordingly, spillover effects in the host country are generally ambiguous.

As indicated in the Introduction, spillovers through FDI can take the form of pecuniary spillovers or technological spillovers. In relation to the worker mobility channel, the former occurs when skilled local employees are paid or offered higher wages by the foreign affiliate in order to stop them from moving to or to attract them from domestic competitors. The latter occurs when domestic competitors recruit local employees who previously worked for or were trained by foreign affiliates. Fosfuri et al. (2001) explore conditions under which pecuniary or technological spillovers emerge.

Fosfuri et al. (2001) use a game theoretic model involving two periods and consisting of a foreign firm with some technological superiority and a domestic firm. They assume foreign technology will spillover only through oral communication or on-the job training, excluding other possibilities including the first two strands (i.e., imitation- and competition-determined spillovers). The foreign firm incurs a fixed cost for establishing operation in the host country but for simplicity this is set to zero (including the training costs of local workers). In the first period, since the local firm has not received the foreign technology, the foreign firm has a monopoly on profit. After the first period of production has taken place, the local firm becomes aware of the possibility of gaining access to the transferred technology through hiring the trained local workers. The foreign firm, on the other hand, prefers to protect the transfer of the technology by retaining the trained worker.

In the second period, if the foreign firm succeeds in retaining the worker, it is able to realize second period monopoly profits. If the domestic firm succeeds in recruiting the trained worker, both firms realize duopoly profits. In this case, the local firm has to offer the trained worker a wage premium (i.e., a fixed cost) greater than or equal to 0 in order to benefit from the technological knowledge the worker received at the foreign firm. The parameter fixed cost measures the transferability of the foreign firm's technology embedded in the trained worker and the absorptive capability of the local firm; the latter interpreted as inversely correlated.

That is, a high fixed cost parameter suggests a low level of absorptive capability and vice versa. If the local worker has received firm-specific technology training, the domestic firm will find it more difficult (i.e., costly) to incorporate the technology into its production process and the parameter fixed cost will be higher. In contrast, if the worker received training in easily transferable technology, such as marketing, managerial or organizational skills, the parameter will be very low.

In the first period, and if the foreign firm succeeds in retaining the trained local worker, pecuniary spillover occurs. That is, the foreign firm has to pay the local worker a wage that is higher than the wage in the local workforce. In the second period (i.e., when retaining the worker), the foreign firm has to offer a wage that is high enough to stop the worker from switching to a local rival. In contrast, if the local firm succeeds in recruiting the trained worker so that it can adapt the foreign firm's technology, technological spillover has emerged. Note that, in both periods and cases (i.e., with and without the movement of the trained worker), pecuniary spillover emerges as the worker has earned a two period wage which is more than the workers in the local workforce could earn.

More specifically, Fosfuri et al. (2001) find that the potential for technological spillovers through labour mobility are more likely to emerge:

i. when the domestic firms use the technology of foreign affiliates in activities that do not fiercely compete with foreign counterparts in the product market. This might occur when the domestic firms operate in a product market which is complementary or unrelated to the foreign counterpart. This implies that a local firm produces a product which is vertically (either downstream or upstream) related to the foreign affiliate's production, operates elsewhere than in the foreign affiliate's sector, and/or supplies its products in geographically different markets than the foreign affiliate's.[6]

ii. when the domestic firm's level of absorptive capacity is high. This suggests that low absorptive capacity due to technological backwardness, as is the case in most developing countries, prevents or at least decreases the potential for spillover effects.

iii. when the nature of training offered by the foreign affiliate is more general rather than on-the job training in product-specific or firm-specific foreign technology. In such cases, the higher the fixed cost

which measures the transferability of the foreign firm's technology, the lower the payoffs the domestic firm would receive when recruiting the trained worker. The foreign firm will therefore find it cheaper to prevent its local worker from switching employer.

Fosfuri et al. (2001) argue that when technological spillovers do not emerge, it is because foreign affiliates manage to prevent the movement of workers to domestic competitors by offering better employment conditions than local firms are able to do. In such circumstance, the host country's welfare might improve due to better employment conditions (e.g., wages) that local workers receive at the foreign affiliates. In this setting, domestic firms are prevented from recruiting trained workers and thereby accessing foreign expertise which in turns limits the potential for technological spillovers. Hence, the potential for technological spillovers is switched to pecuniary spillovers.

The third theoretical model within this strand is by Glass and Saggi (2002). Glass and Saggi analyse an oligopoly model in which foreign affiliates possess more superior technology compared to domestic firms. They argue that superior foreign technology can be transferred to domestic firms through the mobility of workers, but only when domestic firms hire local workers who were previously exposed to foreign technology (instead of being trained as suggested by Fosfuri et al., 2001). In this context, the nature of the training, be it is general or specific, does not, of itself, allow for the acquisition of foreign superior technology. Knowing that domestic workers who are exposed to superior technology are highly attractive to domestic firms, foreign firms weigh the benefit of protecting technology transfer to the domestic counterparts against the cost of paying higher wages to stop local employees from switching employer. Preventing the transfer of superior foreign technology involves higher costs in terms of wage premiums paid to local employees.

Glass and Saggi showed that offering local workers a wage premium that is high enough to keep them at the foreign firm might increase the foreign firm's profits. In this respect, foreign firms maintain their superior technology by paying their employees higher wages in order to increase their profits (i.e., by preventing the reduction of costs in domestic firms). Consequently, such a wage premium plays an important role in preventing the diffusion of superior foreign technology. In such circumstances, the

host country's welfare is improved due to the pecuniary spillovers (an argument in line with Fosfuri et al., 2001), but by being exposed to superior technology rather than by being trained by foreign firms.

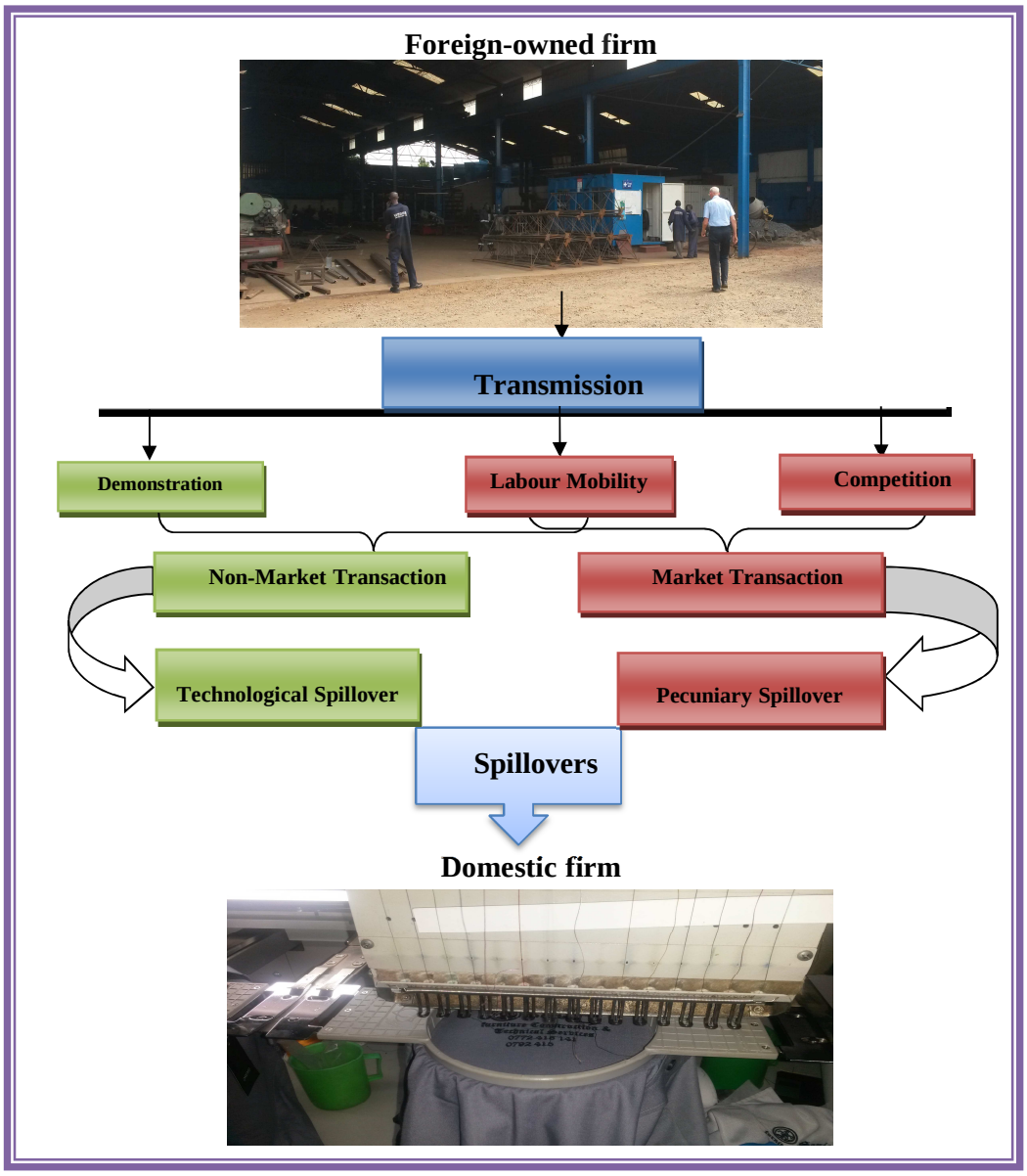
Finally, Glass and Saggi conclude that policies aimed at promoting FDI facilitate either superior technology transfer or improvement in the host country's welfare. For technological spillovers, domestic firms benefit from the transfer of superior technology by recruiting local workers who previously worked for foreign affiliates. For pecuniary spillovers, the host country's welfare might improve as part of the foreign firm's cost saving efforts (i.e., by preventing the movement of local workers) may transfer to local workers in terms of higher wages.

In sum, the aforementioned theoretical spillover models do not provide a complete picture of the intra-sector productivity spillover effects channelled through FDI. That is, they do not provide a theoretical model in which all transmission channels are taken into account simultaneously. In the first strand, the occurrence of spillovers is simply determined by the extent of foreign share in the industry. In the second strand, spillovers are considered to take place endogenously as a result of technological competition between domestic and foreign firms. In the third strand, spillovers are assumed to emerge through the movement of workers being trained by or who worked for foreign firms. Furthermore, the existence, sign and magnitude of these spillovers may largely depend on the existing technological characteristics of the domestic firms. That is, the extent to which spillovers emerge may not appear evenly across all firms. When modelling FDI spillovers, it is also highly important to pay sufficient attention to the heterogeneity of domestic firms (for instance in terms of absorptive capacity and technological levels) and the geographical proximity between domestic and foreign firms.

2.4 Intra-industry spillover effects theoretical framework

In this section, first we present the theoretical framework for intra-industry FDI spillover effects. We then go on to discuss the importance of heterogeneity amongst the host country's local firms in materializing potential spillover effects channelled through FDI. Finally, we relate the topic to the effect of geographical proximity.

Figure 2.1
FDI-induced spillovers and their transmission channels



Source: Author's design.

2.4.1 Spillover transmission channels and foreign firms

Figure 2.1 gives the theoretical framework for intra-sector FDI spillover through which the effects can be transferred to host country firms. The framework depicts not only the mechanisms through which superior foreign technology can be transmitted, but also the nature of the spillover effects outlined above (technological versus pecuniary).

In line with the discussions outlined above, along the horizontal axis Figure 2.1 depicts the transmission channels and the extent of technological or pecuniary externalities. Firstly, the imitation/demonstration-determined spillover effect is probably the most classic technological spillover (Blomström and Kokko, 1998; Das, 1987). This effect is placed on the left-hand edge along the horizontal axis on the non-market transactions side, suggesting an effect of technological spillovers as described in Section 2.2. The imitation of new products and processes provided by FDI in the host market is assumed to speed up the access and utilization of technologies by domestic firms. In its simplest form, the argument hypothesizes that exposure to foreign affiliates' superior technology can lead to productivity or efficiency gains for local firms in the host country by enhancing their production methods as discussed in the first strand of the theoretical models. Before the entry and operation of foreign firms, domestic firms may neither be aware of the existence of a specific superior technology, nor consider it profitable to try to access it (Blomström and Kokko, 1998). Moreover, face-to-face contacts, the dissemination of information via trade journals, and meetings of business organizations are more likely to create opportunities for learning and information spillovers, yielding imitation effects (Jordaan, 2012). The relevance of this imitation effect is expected to increase with the similarity of the product produced by the two types of firms (Barrios and Strobl, 2002).

Secondly, the so-called competition effects are placed on the right-hand edge along the horizontal axis on the market transactions side, yielding pecuniary spillovers. Competition in the host market between domestic and foreign firms can be interpreted as an incentive for domestic firms to use existing technology and resources more efficiently or even to adopt new technology (Crespo and Fontoura, 2007; Görg and Greenaway, 2004). In contrast, negative pecuniary spillover effects from FDI can be illustrated by the market stealing or the market reallocation effect (Aitken and Harrison, 1999). For example, foreign firms may take over part of the local market in which domestic firms operate and thus lower the domestic

firms' market share. Another negative effect is the crowding out effect. In this case, the presence of FDI may draw resources away from domestic firms and push domestic firms out of their market if they are unable to compete (Smeets, 2008). This is in line with the competition-determined theoretical model by Wang and Blomström (1992) which suggests that local firms that are more competitive relative to foreign firms are more likely to stimulate positive pecuniary spillovers.

Thirdly, in the centre of the horizontal axis, Figure 2.1 shows the labour mobility channel that works via either technological or pecuniary spillovers, as outlined in the third strand of the theoretical models. On the one hand, technological spillover occurs when a domestic firm hires workers who had previously worked for or were trained by foreign affiliates, allowing a domestic firm to benefit from the experience and knowledge acquired in the foreign firms (Görg and Greenaway, 2004; Saggi, 2002). This effect also occurs (but is not explicitly considered in the worker mobility-determined theoretical models) when local workers who were trained by and accumulated skills and knowledge while working for foreign affiliates go on to set up their own business (Poole, 2013). Local workers, therefore, are more likely to acquire tacit knowledge through training, social interaction and experience while working for foreign counterparts (Liu et al., 2014).

On the other hand, foreign firms may attract skilled local workers by paying higher wages than domestic firms. As indicated in the worker-determined spillovers, this gap in wages between foreign and domestic firms can change the potential for technological spillovers into pecuniary spillovers in two ways. First, the additional experience and knowledge acquired by local workers while working for foreign affiliates might be available to the domestic firms at a price equivalent to this wage premium, thereby transforming potential technological spillover into pecuniary spillover. This wage premium measures the transferability of foreign technology as hypothesized by Fosfuri et al. (2001). Second, the presence of higher wages may put upward pressure on the overall industry wage rate, resulting in a negative effect on the profits of domestic firms. This may put pressure on domestic firms to be more efficient, which in turn may lead to positive pecuniary spillovers via the market mechanism.

Empirically, the relative importance of labour mobility through either technological externality or pecuniary externality is difficult to investigate since it requires tracking workers employed or trained by foreign affiliates

(e.g., see Poole, 2013; Liu et al., 2014). Furthermore, this mechanism differs from the other transmission mechanisms as the skills and knowledge embodied in human capital move only via the physical mobility of workers across firms (Crespo and Fontoura, 2007; Saggi, 2002).

In addition to the above three channels, one can argue that inter-sector or vertical linkages (either backward or forward) might be considered as part of the FDI-induced spillovers framework as they resemble pecuniary externalities. The seminal theoretical contributions by Rodriguez-Clare (1996), and Markusen and Venables (1999) show how FDI presence influences the monopolistic nature of the intermediate sector or the input-output linkages. As is the case with backward linkages, FDI presence may put pressure on local suppliers to, amongst others, meet speed of delivery, standards of reliability, higher quality and lower input price. As is the case with forward linkages, FDI presence may act as an input (suppliers) that possibly upgrades the quality of the product and the production process. This is because FDI forward input linkages could be either technologically advanced, or have been previously unavailable, or less expensive or accompanied by complementary services (Javorcik, 2004a).

However, a theoretical model on industrial development by Pack and Saggi (2001) for instance, suggests that vertical linkages are technology transfers but not spillovers. This theoretical argument is backed up by empirical studies that demonstrate the presence of a measure of knowledge transfer rather than knowledge spillover. For instance, Blalock and Gertler (2008), investigating Indonesian manufacturing firms, report strong evidence of productivity gains, lower price, and greater competition among domestic firms that supply foreign entrants. They interpret these effects as knowledge transfers rather than knowledge spillovers. Considering this distinction, mistakenly assigning knowledge transfer as a beneficial effect of FDI (either technological or pecuniary spillovers) may encourage policy-makers to facilitate wasteful and thus costly FDI policies.

The entry and operation of export-oriented foreign firms may also influence domestic firms through the provision of product and process technologies and foreign market conditions (Blomström and Kokko, 1998). Export effects related to the presence of exporting foreign firms may facilitate the imitation of the exporting process, thus making it possible to penetrate export markets or to increase export performance (Crespo and Fontoura, 2007). Domestic firms learn how to export via the activities of

foreign exporting firms, for example via their product distribution networks, their knowledge of foreign consumers' tastes, or the packaging of their products (e.g., Görg and Greenaway, 2004; Kokko et al., 2001). Unlike the aforementioned benefits of productivity spillovers that can also be grouped into knowledge and competitive spillover effects, the benefits obtained through export activities are called market access spillovers (Blomström and Kokko, 1998).

Having said this, it may be important to investigate market access spillovers and inter-sector linkages as the effects accompanied by FDI presence. To investigate these kinds of foreign effects, however, requires additional information. For instance, investigating inter-sector effects involves studying detailed information on the input-output matrices of the inter-sector relationships between domestic and foreign firms. However, this information is not available in our dataset. In this thesis, therefore, we focus on exploring the productivity spillovers within the same sector - intra-sector spillovers.

2.4.2 Transmission channels and domestic firms

Not only the presence of FDI and the channels outlined above, but also various factors related to the characteristics of domestic firms can determine the nature and occurrence of spillovers (Hamida, 2013; Jordaan, 2012;). This theoretical argument raises a hypothesis that given the heterogeneous nature of domestic firms, universal spillover effects that accrue equally with all types of domestic firms may not be valid. A universal spillover approach may not illustrate what benefits domestic firms gain - some may experience a positive effect, others negative or even nothing at all. It would therefore seem that the condition of the host firms through which potential spillovers may come about are an essential component of a research agenda (Findlay, 1978; Girma and Görg, 2007; Smeets, 2008; Wang and Blomström, 1992).

With respect to the technological gap, two different theoretical perspectives exist. One group posits that when there is a large technology gap, the low technological capacity of domestic firms may increase the opportunity for spillover benefits. Inspired by the original thoughts of Gerschenkron (1962) and Veblen (1915) the theoretical models discussed above in the first and second strands of spillovers by Findlay (1978) and Wang and Blomström (1992) support a larger gap hypothesis, indicating a

positive relationship between the size of the technological gap and the potential for spillover benefits. In contrast, the other group assumes that a smaller technology gap between the domestic firm and the foreign firm may lead to potential spillover benefits. Lapan and Bardhan (1973) and Cohen and Levinthal (1989), for instance, support this hypothesis, suggesting that a small or moderate gap between local and foreign technology results in larger spillover benefits.

Furthermore, Kokko et al. (1996) argue that small or moderate technological difference may assist domestic firms to identify cases where advanced foreign technology is relevant. This in contrast to a large technological difference which may suggest that domestic firms have nothing to learn from this technology, that their technological capability is too weak to use foreign technology, or that the products manufactured by foreign firms are very different from the products made by local firms. Jordaan (2008a), on the other hand, draws a contrary conclusion – a larger technological gap enhances the occurrence of spillover effects.

Considering the workings of the transmission channels, according to Mody (1989), technologically highly developed domestic firms are likely to gain potential spillover benefits via the imitation and/or the competition channels. Mody further argues that technologically weak domestic firms are likely to benefit through the mobility of workers as this may provide personal assistance to help firms to better understand and use advanced foreign technology. As Hamida (2007) argued, even firms with low technological capability may internalize some spillover benefits. Hence it appears that only firms with very low technological complementarities to foreign firms may not experience potential spillover gains arising via any of the channels. Such domestic firms may eventually be forced to size down or leave the local market completely.

Another firm-level heterogeneity that can mediate the potential for spillover effects is absorptive capacity (Cohen and Levinthal, 1989). Following the definition by Narula and Marine (2003:23), the concept of absorptive capacity refers to '… the ability to internalize knowledge created by others and modifying it to fit their own specific applications, processes and routines'. This indicates that for domestic firms to be able to exploit potential spillovers from superior foreign technology requires training and learning-related investment efforts. In this case, only domestic firms with sufficient absorptive capacity levels are likely to experience the potential for spillover benefits efficiently. For instance, Hamida (2013) performs a

panel regression for Swiss manufacturing firms and finds that FDI presence will generate spillover effects only if local firms invest in their absorption capacity. Kathuria (2001), as well as Narula and Marine (2003), present similar arguments. In this regard, although absorptive capacity also involves a firm's ability to imitate new product technology or processes, it mainly encompasses a firm's ability to assimilate and exploit outside knowledge, indicating a sort of learning that differs from learning-by-doing (Cohen and Levinthal, 1989). Accordingly, identifying the transmission channels alone may not be sufficient if spillover effects can vary based on the characteristics of local firms.

2.4.3 Spillovers transmission channels and geographical proximity

Recent attempts have focused on whether FDI spillover effects are related to geographical distance. In other words, whether spillover benefits can be circumscribed geographically, whereby domestic firms would be more likely to experience spillovers when they operate physically closer to foreign firms (Blalock and Gertler, 2008). The main reason that this would occur is that spillover benefits are reinforced first through neighbouring domestic firms, and then spread to geographically more distant firms (Aitken and Harrison, 1999). Hence, the scope of spillover benefits is assumed to reduce with distance (Girma, 2005; Greenaway et al., 2004). Intuitively, the effectiveness of the transmission channels is likely to be enhanced by the geographical proximity or concentration of firms (Jordaan, 2012).

More specifically, Girma (2005) summarizes three main reasons for the geographical dimension of spillovers and their diverse channels. First, the theory of economic geography indicates that the potential for spillovers is more pronounced when both types of firms are in geographic proximity to each other. For instance, Marshall (1930) argues that knowledge spillover among firms in an industry may have geographical boundaries. Marshall identified that the intra-industry knowledge spillovers and the pooling of demand for skilled labour are two main factors of geographical proximity or concentration of industries. Jaffe et al. (1993) underscore the importance of location proximity in relation to the extent to which knowledge spillover is mainly geographically localized. Furthermore, Audretsch and Feldman (1996) suggest that the cost of transmitting knowledge spillover increases with geographical distance.

Second, at least initially, imitation effects first benefit neighbouring domestic firms or firms that operate in the same region as foreign firms. Imitating the production of a new product or the efficient production of existing products is more likely to take place when both firms are in proximity to each other (Jordaan, 2005). Third, labour mobility is likely to be confined to the same locality. It appears unreasonable to assume that it would be easy for local firms to identify and attract workers trained by or who worked for foreign affiliates if such workers are in another region. However, this contrasts with the worker mobility-determined spillovers theoretical model (see Fosfuri et al., 2001) or adds an extra layer of understanding about the geographical dimension of worker mobility. Fosfuri et al. (2001) hypothesize on the expected workings of this channel if the local firm sells its products in a different geographical area than the foreign affiliate. This means that the local firm should not be a direct competitor of the foreign firm in a given region.

To put it differently, the competition channel is the only channel in which the effect of geography appears to be unclear (Jordaan, 2005). Jordaan argues that competition is the only channel in which the presence of foreign firms associated with geographical proximity is more likely to enhance the occurrence of both positive and negative effects: the other two channels are expected to stimulate positive effects. He therefore concludes that, leaving aside the competition channel, it can be hypothesized that both imitation and worker mobility facilitate positive spillovers when geographical distance between the two firms is taken into account. In all cases it appears that geographical proximity and location matter for potential productivity spillover benefits.

This being so, it does not mean that spillovers cannot emerge at a national level or between regions. The literature seems to assume that it is more likely that negative spillover effects will be generated from geographically distant foreign and domestic firms. However, this negative effect does not appear to be so strong that national level or inter-regional spillovers do not emerge (Jordaan, 2012). Most importantly, enough studies acknowledge either negative or insignificant spillover effects when geographical proximity is considered (e.g., see Blalock and Gertler, 2008; Konings, 2001; Sjöholm, 1999b). This may suggest that estimations of FDI spillover effects should also aim to identify separate regressions for geographical proximity at the regional level, in addition to investigating nationwide effects.

2.5 Discussion and conclusion

We have identified three strands of theoretical models for potential FDI spillover effects: imitation-determined spillovers, competition-determined spillovers and labour mobility-determined spillovers. These productivity spillover effects are grouped into knowledge and competitive spillover effects. The former refers to the workings of the imitation and worker mobility effects, the latter involves the competition-related spillover effects. Each of the theoretical models provides a partial analysis of the intra-sector spillovers. The models are restricted to one of the mechanisms by which spillovers are expected to emerge, namely, either imitation effects, competition effects, or movement of workers. The first theoretical strand argues that potential spillovers largely depend on the presence of foreign equity participation alone, indicating imitation or contagion spillovers. This strand suggests that spillover benefits are the outcome of foreign presence alone, excluding other spillover channels. It also states that all local firms are assumed to benefit equally through the imitation effects. Foreign presence is assumed to be totally beneficiary to the host country in which spillovers can be internalized and applied efficiently by domestic firms free of charge. This suggests that the advanced technology of foreign firms has a 'public good' nature and spills over automatically.

The second strand includes a major theoretical contribution by Wang and Blomström (1992) who state that the occurrence of spillovers is competition-determined. They recognize the transfer of advanced technology to subsidiaries in the host country and that the spillovers are a costly process of investigation and application of advanced foreign technology. There is therefore no free copying of foreign technology. The model highlights the essential role played by competing domestic firms in accelerating the rate at which foreign firms transfer technology from parent firms. The model also recognizes the learning by watching imitation-determined spillovers of the first model, but mainly emphasizes the competitive pressure of the local market. Consequently, the competition-determined spillovers approach argues that FDI is necessary but not sufficient. An important theoretical contribution by Wang and Blomström (1992) suggests that a host country's policy measures aiming at coordinating domestic firms' investment and accelerating their efficiency in learning transferred technologies tend to speed up the transfer of advanced technologies. In this way, spillover effects are expected to emerge or be enhanced via competition in the host market.

The first and second strands of the theoretical models suggest that spillovers can be expected to emerge or increase through either the level of foreign presence, or endogenously resulting from the technological competition between foreign and domestic firms, respectively. The third and most recent strand, on the other hand, suggests that spillovers take place largely through the mobility of workers. In line with the literature on labour economics, greater labour mobility, and thus a higher potential for spillovers, is expected when employees have general on-job training rather than more firm-specific technology training with foreign affiliates. The latter is assumed to be more costly for local firms wishing to adapt the new technology to their production process. In view of this contribution, not only general versus specific training but also competition in the product market affects the movement of workers.[7] Furthermore, it is not only the *nature* of the training (as argued in Fosfuri et al., 2001), but also whether, as posited by Glass and Saggi (2002), local workers exposed to a foreign firm's superior technology greatly affect the nature of potential spillovers that is relevant. In our view, the latter seems highly important for potential spillover to take place. This is because technology has not only an observable element, but also a tacit and codified character that is most unlikely to be captured simply through general on-the-job training.

Furthermore, in the third theoretical model, we observe that FDI induces not only potential technological spillovers (as is the case in the first and second models) but also pecuniary spillovers. The third strand, therefore, indicates that the policy rationale for promoting FDI as it may result in foreign firms paying higher wages for local workers or transferring superior foreign technology to host firms. We agree that the latter is less likely to take place in a developing country context where foreign firms pay higher wages, making the wage premium higher and limiting labour mobility (e.g., see Aitken et al., 1996; Glass and Saggi, 2002). In this setting, foreign affiliates are more advantaged relative to host firms even though the host country benefits from the pecuniary spillovers.

Hence, over the last four decades, a wide range of literature has developed the theoretical concept of intra-sector spillover effects. Too often, the existing models have not provided a complete picture of the indirect FDI effects, i.e., do not provide the whole picture of spillover transmission channels by taking them all into account simultaneously. This is very important since the occurrence, sign and size of spillover effects can vary with respect to the transmission channels. For example, while increased

competition induced by foreign presence is an incentive for domestic firms to use existing resources and technology more efficiently or even adopt new technologies (Crespo and Fontoura 2007), competition may generate crowding out, market stealing, or losses (Aitken and Harrison, 1999). Similarly, it is important to not only consider the positive impact of the possibility of hiring workers who have worked for foreign firms, but also to emphasize the possibility of a negative impact (zero effect) from poaching (protecting) local workers to move away from domestic firms (back to domestic counterparts) (Saggi 2002, Sinani and Meyer, 2004). Hence, the combination of the three spillovers models helps to gain a better understanding of the comprehensive spillover effects associated with FDI.

A final point is the intra-sector spillover aspect.[8] Having discussed the concept of FDI spillovers and the theoretical transmission channels through which spillover effects can emerge, the next chapter presents the body of the empirical evidence. That is, it will offer a quantitative survey of existing empirical literature. In what follows we refer to the intra-sector spillover effects in developing countries. The issue is that productivity spillover effects may occur differently in developing and developed countries. Multiple explanations could be behind this difference. Empirical analysis (as well as theoretical studies), suggest one possible explanation for this. They indicate that the larger the size of the technological gap, the less FDI is significant for the host country. In such a context, the expected occurrence of spillover effects in developed countries is likely to differ from those in developing countries. Another explanation is that the workings of the channels seems to differ between developing and developed countries. For instance, the mobility of workers from FDI to host firms occurs mainly in developed countries, as illustrated in the theoretical model by Glass and Saggi (2002). Evidence shows that FDI pays higher wages relative to local firms and usually these wage differentials are larger in developing countries (e.g., see Aitken et al., 1996; Globerman et al., 1994; Haddad and Harrison, 1993). If this is the case, spillovers due to the worker mobility channel may predominantly accrue in developed countries. In fact, Wooster and Diebel (2010) argue that it is important to distinguish the effects, as developed countries may generate spillover gains that are not apparent in developing countries.

Notes

[1] A similar definition is available from the Organization for Economic Cooperation and Development - OECD (4th edition, 2008:22).

[2] We will refer to spillovers and externalities interchangeably throughout this thesis.

[3] In addition to the aforementioned scholars, in the work of Coe et al. (1997) there is a suggestion to extend the discussion on international trade for R&D spillovers from North to South to incorporate measures of FDI. Specifically, they suggest to '… investigate the interaction of FDI with R&D and human capital, and to examine the extent to which FDI and trade are complementary vehicles for R&D spillovers' (Coe et al., 1997:24). The seminal work by Grossman and Helpman also describes the idea that international trade enables technological progress to spill over: that '… invention in the North and imitation in the South gives rise to a product cycle in international trade' (Grossman and Helpman, 1994:28). That is, firms in the North produce and export goods that are technologically advanced and the South imitates these products and processes that may lead to more widely known products and production methods.

[4] It has been in the background of several spillover theoretical models (e.g., see Das, 1987; Findlay, 1978). However, until the development of this theoretical model, the channel of worker mobility had not been posited in the aforementioned theoretical literature.

[5] This is a model of sequential oligopoly firm behaviour where either firms choose how much to produce or charge in a situation when one firm acts as a market leader and the other firm(s) is (are) follower(s).

[6] Strong competition is also interpreted as meaning that the domestic firm can make lower profits by recruiting the trained worker to make use of the foreign firm's technology. In this case, the foreign firm may retain the worker by paying a small additional second period wage, enough to keep the worker, suggesting pecuniary spillover.

[7] Becker (1964) coined the distinction between specific versus general training. Since then, it has become known that the more the specific the opportunity for training or the less easy the possibility of technology transfer, the lower the expected mobility of workers is (Fosfuri et al., 2001). Hence, the addition by Fosfuri et al. (2001) is related to that of product market competition.

[8] We address an aspect of the micro FDI motives, namely, the intra-sector spillover. It should be noted that we are aware of the macro FDI motives in the host country (as illustrated in Figure A2.1) but are not incorporating these into this thesis. For a review of FDI growth effects, see, for example, macro-economic studies presented by Borensztein et al. (1998), Xu (2000), Chowdhury and Mavrotas (2006), Hansen and Rand (2006) among others.

3 Publication bias in FDI productivity spillovers in developing countries: A meta-regression analysis[1]

[1] The chapter is based on an article published in 2015 in the *Journal of Applied Economics Letters*.

Abstract

We use a recent meta-regression analysis (MRA) method to investigate publication bias of the intra-sectoral foreign direct investment (FDI) spillovers in a large sample of developing countries. Recent meta-analyses on this topic have suggested that publication bias is not a problem for this field. Using a much larger sample of studies, this chapter, however, finds substantial evidence of publication bias, namely, evidence suggesting a preferential tendency to publish a paper if studies reject the null hypothesis, that is, when the investigations produce positive and statistically significant findings. We collect 1,450 spillover estimates conducted by 93 researchers from 69 primary empirical studies dealing with 31 developing countries carried out up to and including 2013. We find that the FDI spillover effects are suffering from significant and meaningful publication bias. The bias ranges from 0.505 to 1.335, implying that the empirical effect size appears substantially much larger than the actual spillovers. Our results also indicate that for this field of research, publication bias is largely due to self-censorship rather than censorship by journal reviewers and editors. This bias first appeared in the literature temporarily in 2003 and it has been permanently established since 2005.

3.1 Introduction

Publication bias is widespread and poses a serious empirical studies concern (Doucouliagos and Stanley, 2013). According to Doucouliagos et al. (2005:321), publication bias is an '… often covert form of bias in empirical research arising when the selection of studies for publication is made on the basis of the statistical significance of results, and/or whether the results satisfy preconceived theoretical expectations'. It is viewed as the consequence of selecting research findings or results for their statistically significant results or whether findings satisfy prior theoretical expectations. Results of statistically significant research papers often tend to be more favourably treated by empirical researchers, editors or reviewers which may lead to over-representation of a larger given effect or more significant effects. Research papers with a smaller given effect, or with statistically insignificant effects, however, tend to remain or hidden in the desk drawer and hence under-represented (Rosenthal, 1979; Stanley, 2008). If such bias exists, it can potentially lead to distorted empirical research inferences, both with respect to scientific conclusions and policy-makers decisions.

As a result, '[m]any other commentators have addressed the issue of publication bias … All agree that it is a serious problem …' (Begg and Berlin, 1988:421). Although considerable attention to the issue of publication bias has been given in psychology and medicine (Begg and Berlin, 1988; Rosenthal, 1979), it has recently also been acknowledged as a serious threat in empirical research in economics, and hence many empirical economists have started to address this issue (Doucouliagos et al., 2005; Stanley, 2005). For instance, Ashenfelter et al. (1999) reported that the estimated rate of return to education is biased towards positive and significant results; Stanley (2005) established a statistical preference for negative and significant results for water price elasticities; Doucoliagos (2005) showed that the impact of economic freedom on economic growth is strongly tainted with positive and significant publication bias; Havránek (2010) found a preference towards positive and statistically significant findings in the effect of currency unions on trade; and Lazzaroni and van Bergeijk (2014) established publication bias towards significant negative results in the macroeconomic impact of natural disasters.

In particular, Görg and Strobl (2001), who report evidence of bias using a sample of 23 observations from 21 studies for developing and developed countries, first investigated publication bias in this field. In contrast, two

more recent meta-analyses by Iršová and Havránek (2013) and Mebratie and van Bergeijk (2013) conclude that publication bias is absent in this literature. Iršová and Havránek (2013) analyse 52 studies published after 2000 with 1,205 observations from developing and developed countries. Mebratie and van Bergeijk (2013) study 156 observations from 30 studies in developing and emerging economies using one study per country published up to and including 2010. Although the evidence for publication bias in this literature is still not conclusive, the findings to date in economics as illustrated above strongly suggest that the issue of publication bias is a serious threat and a widespread phenomenon.

The three previous meta-analyses in this literature should be viewed as partial meta-analyses of intra-sectoral FDI spillovers, as the datasets were restricted to either a given period of time or had very narrow selection criteria. We have therefore revisited the publication bias phenomenon using existing published and unpublished primary studies conducted up to an including 2013 dealing with developing countries. Accordingly, the aim of this study is to investigate the issue of publication bias in the micro-econometric literature of intra-industry productivity spillovers from FDI[2] using a larger, more comprehensive dataset. To do so, we apply visual inspections of funnel plots, a meta-significance test (MST) and a funnel asymmetry test (FAT). The current meta-analysis that comprises all reported and available observations for developing countries from the mentioned studies can be considered as a more comprehensive version of previous meta-analyses.

This chapter is structured as follows: Section 3.2 discusses the method of data construction and the meta-dataset. The empirical approaches are presented in Section 3.3. Section 3.4 offers the investigation of publication bias. Section 3.5 concludes.

3.2 Data and methods

3.2.1 Methods, protocol and data construction

Our dataset was constructed by following completely the MAER-Net prescriptions listed in Section 2.2 of Stanley et al. (2013) from a more comprehensive computer search of various sources. The search of literature uses the Economics Literature Index database (EconLit) and is supplemented with Google Scholar and Scopus.[3] It also uses the database on

firm-level empirical studies provided by the World Bank (2012). We searched using the keywords: 'productivity spillover+FDI', 'productivity spillover+FDI+developing countries', 'FDI presence effect on host economy', and 'technology transfer foreign firms'. The search yielded a gross list of 233 potentially relevant studies.

Studies to be included in the meta-regression analysis (MRA) had to satisfy the following criteria: English language[4] empirical micro-econometrics[5] that study intra-industry[6] FDI spillover effects that report regression-based coefficients. This resulted in 74 primary studies for coding. To the best of our comprehensive search, these empirical studies can be considered as the entire population of currently (as of September 2013) available published and unpublished studies of FDI spillover effects. A second reviewer checked the consistency of the data and coding with an initial data collection and coding disagreement rate of 4.3 per cent. After double-checking initial disagreements, consensus was reached. The search process and data coding was conducted from May – September 2013.

Following the advice of Stanley and Doucouliagos (2012), we use all reported estimates. Some 86 per cent of the models are estimated in log-linear functional form. When the primary studies use the double-log or linear functional form, we had to re-compute the effect size by using sample means (see Gujarati and Porter, 2009).[7] Instead of omitting, we contacted authors when sample means, coefficients, observation size, *t*-statistics or standard errors were not reported in the primary studies. In total 37 email requests enabled us to include another 334 (about 23 per cent) observations. Five studies[8], that is, 95 observations were excluded due to authors' failure to provide missing information, and hence we used 69 primary studies to explore the research objective.

3.2.2 Meta-dataset

From the 69 primary empirical studies, two different datasets are derived. First, we constructed a dataset of all reported coefficients from each of the empirical studies. Multiple estimates are a common standard in economics mainly due to the demand from journal editors and reviewers that empirical studies should provide multiple models, methods and estimates to ensure that main findings are robust (Stanley and Doucouliagos, 2012). This offers more observations to explain the issue of publication bias in the literature. In this case, the dataset refers to the full dataset that involves

1,450 observations from 69 empirical studies in 31 developing countries. The median number of parameter estimates taken from a primary study is 11. The mean and maximum are 21 and 100, respectively. The study includes 43 peer-reviewed journal articles and 26 working papers, dissertations, book chapters and unpublished studies. The first study appeared in 1986, the most recent in 2013 and the median study appeared in 2008. Hence, half of the research in question was published in the last five years. This implies that this topic is debated lively and that many new investigations of spillovers from FDI have appeared.

Second, we constructed a dataset of average estimates from all reported estimates so that only one coefficient was derived from each study. In this case, the dataset constitutes 69 observations from 69 empirical studies. This dataset is denoted as the averaged dataset (can also be referred as one-estimate-one-study dataset) computed from all reported estimates within each study. The two different datasets are used for two main reasons. First, the approach of one-estimate-one-study dataset (averaged dataset) can be desirable both in order to eliminate the issue of within-study dependence and to further check robustness of the full dataset approach. That is, whether the problem of publication bias exists throughout all reported estimates or only in the one-estimate-one-study dataset. Second, by comparing the results of the two datasets, i.e., full dataset versus one-estimate-one-study dataset, we may provide policy inferences that can be more reliably drawn from all estimates or average estimates (Doucouliagos, 2005). In both cases, data on reported estimates of the effect size and sign, sample means, observation size, *t*-statistics, or standard errors were collected.

To account for outliers, we applied the multivariate outlier method proposed by Hadi (1994) as we want to use spillover coefficients together with their precision to filter publication bias and identify outliers jointly.[9] Consequently, about 14 per cent of the observations are identified as outliers. More than two out of three of the outliers are either from unpublished studies or have a zero 5-year impact factor reported in the Institute of Scientific Information (ISI) as of August 2013. Thus, if we consider the assumption that better ranked journals publish more reliable findings, these outliers are identified as lower quality as compared to the non-outliers. We report the findings without outliers, but for sensitivity analysis, we provide the full data in the Tables 3.2 and 3.4 and note that the inclusion of outliers yields similar results.

3.3 Empirical approach

3.3.1 Funnel plots

A common method used to detect the presence of publication bias is a funnel plot (Sutton et al., 2000).[10] A funnel plot is a scatter diagram with the reported spillovers on the horizontal axis and its precision on the vertical axis (usually the reciprocal of the standard error). In the absence of publication bias, a funnel plot should be symmetrical and resemble an inverted funnel, because small sample sizes (imprecise estimates/large standard errors) are widely dispersed at the bottom of the funnel (Stanley, 2005). In contrast, large sample studies with usually more precise estimates should be more compactly distributed at the top of the funnel (Stanley and Doucouliagos, 2010). In the case of bias, a funnel plot will be asymmetrical. In this regard, there is a preference for statistically significant results in the reported spillover estimates in a given direction (Doucouliagos et al., 2005). Asymmetrical plots may also indicate that some parameter estimates are discarded or unreported (Iršová and Havránek, 2013). However, this method of publication bias detection is subjectively based on visual inspection and therefore is less convincing. Hence, the formal statistical method of MRA is required.

3.3.2 Statistical analysis

We start the investigation of the issue of publication bias through a MST. The logic behind the MST is that the presence of a true effect between productivity spillovers and FDI can be indicated through a positive association of the natural logarithm of the observation size and the natural logarithm of the absolute value of the *t*-stat (see Lazzaroni and van Bergeijk, 2014; Stanley, 2005). That is, in the presence of a genuine spillover effect, as estimates from large sample studies are usually more precise, the natural logarithm of the absolute *t*-value, t_{ij}, of the spillover variable, will have a positive and significant relationship with the logarithm of its observation size, $Sobs_{ij}$:

$$\ln|t_{ij}| = \beta_0 + \beta_1 \ln Sobs_{ij} + u_{ij} \quad \text{.....(3.1)}$$

i and *j* represent the estimate and the study, respectively. As Stanley (2005) argues, the slope of equation (3.1) provides empirical information

of a genuine underlying effect, of publication bias, or both (see also Doucouliagos, 2005). The reasoning is that if $B_1 > 0$, there is a genuine spillover effect from FDI as the observation size, $Sobs_{ij}$, rises, the *t*-value of the estimated spillover effect, t_{ij}, increases in absolute value. In contrast, i.e., if $B_1 < 0$, then the intra-industry productivity spillover from FDI is tainted with publication bias. This is because as the observation size, $Sobs_{ij}$, falls, the *t*-value of the estimated spillover effect, t_{ij}, rises or vice versa. Doucouliagos (2005) puts it differently: studies with smaller observation sizes attempt to report larger *t*-values in order to increase the potential for publication or provide statistically significant results. If the slope of equation (3.1), B_1, is between 0 and 0.5 (i.e., $0 < B_1 < 0.5$), there is a genuine effect of FDI on productivity spillover and publication bias in the reported estimates (Doucouliagos, 2005; Stanley, 2005).

We also need a more powerful statistical method of MRA, since in the case when the reported estimates are contaminated with publication bias (i.e., if $B_1 < 0$ or if $0 < B_1 < 0.5$), the method of MST for a relationship between the observation size and t-value is distorted (Doucouliagos and Stanley, 2013; Stanley and Doucouliagos, 2012). Empirical researchers in medicine, for instance Egger et al. (1997), have offered a regression-based analysis of publication bias that investigates for a significant relationship between an intercept term in a regression of *t*-value on the reciprocal of its standard error (see also Stanley, 2005, 2008; Stanley et al., 2010). In other words, this is the weighted least squares (WLS) version of a regression of the reported effect size of a study on the associated standard error (Doucouliagos et al., 2005). This method of investigating the issue of publication bias is called a funnel asymmetry test (FAT) as this test is derived from the funnel plots (Stanley, 2005; Stanley and Doucouliagos, 2012).[11] Accordingly, the method of FAT involves the following MRA:

$$effect_{ij} = \beta_0 + \beta_1 Se_{ij} + u_{ij} \quad \text{.....(3.2)}$$

where $effect_{ij}$ is the reported spillover effect of the i^{th} estimate reported from the j^{th} study and Se_{ij} its associated standard error. U_{ij} is the error term. The idea is that, in the absence of publication bias, the estimated effects ($effect_{ij}$) should vary randomly around B_0 (its standard error, Se_{ij}, will approach zero) and should be independent of their standard errors (Doucouliagos and Stanley, 2013; Roberts and Stanley, 2005; Stanley, 2005). As suggested by Card and Krueger (1995), researchers may be predisposed to

select expected estimates (or work with prior beliefs for their estimates) through searching across specifications, econometric techniques or data. If this is the case, then the estimated spillover effect and its standard error may be correlated. In contrast, in the absence of publication bias, no relationship is expected between the reported effect size and the associated standard error (Doucouliagos et al., 2005). According to Stanley and Doucouliagos (2012), dividing equation (3.2) by Se_{ij} to adjust for potential heteroscedasticity, yields the weighted least squares (WLS) version:[12]

$$t_{ij} \equiv effect_{ij}/Se_{ij} = \beta_1 + \beta_0(1/Se_{ij}) + e_{ij} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3.3)$$

where t_{ij} now represents the t-value of i^{th} spillover estimate from the j^{th} study, $1/Se_{ij}$ its precision or invers of its standard error and e_{ij} is u_{ij}/Se_{ij}.[13] The conventional t-test of the intercept term of equation (3.3), β_1, is used to test for publication bias reported in the literature of spillover estimates, and the sign of this estimate suggests the direction of publication bias (Egger et al., 1997). In other words, by testing $B_1=0$, we investigate the issue of publication bias, i.e., the presence of publication bias can be detected if reported estimates correlate with their standard errors.

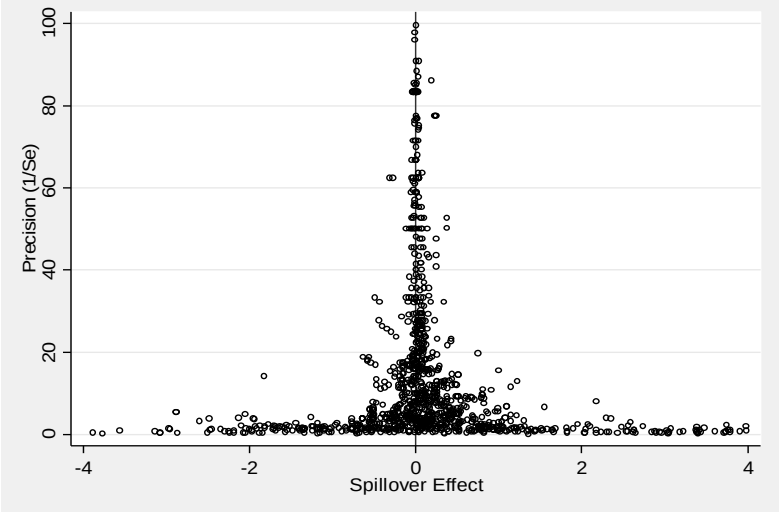
In regression (3.3), when more than one estimate from each study is collected, within-study dependence could be an important source of potential estimation bias (Rosenberger and Loomis, 2000; Bateman and Jones, 2003). This means that multiple estimates from the same studies are likely to be correlated as they share the same characteristics.[14] Hence, in order to account for within-study dependence, we use a mixed-effects multilevel model (MEM) (Doucouliagos and Stanley 2009). Furthermore, we use study-level clustered data analysis (CDA) and only reported estimates from peer-reviewed studies to check for robustness. Finally, both in order to eliminate within-study dependence and to further check robustness, we also use simple averages across each study.

3.4 Results and discussion

3.4.1 Graphical inspection

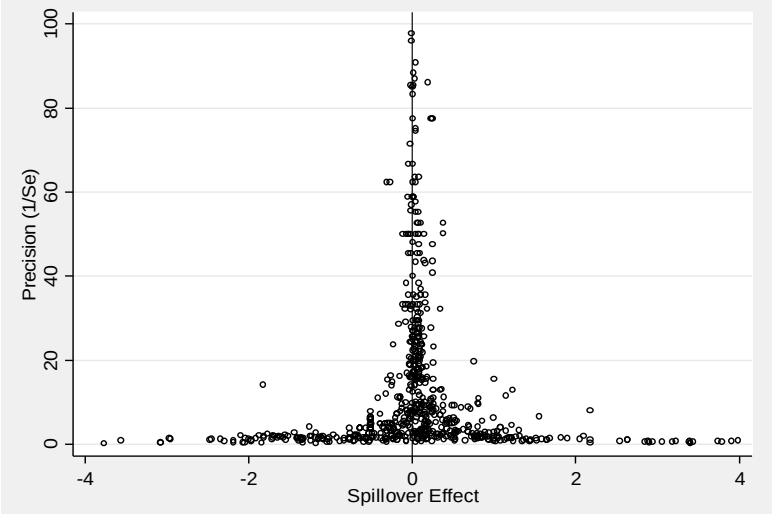
Figure 3.1 shows the funnel plots of all estimated spillover effects. The plots have a slightly heavier midsection on the right-hand side of the plot, implying that comparatively too many positive results are reported in the literature.[15]

Figure 3.1
Funnel plots of estimated FDI spillover effects: all studies



Source: Author's compilation from 1,233 reported estimates of spillover parameters.

Figure 3.2
Funnel plots of estimated FDI spillover effects: peer-reviewed studies



Source: Author's compilation from 694 reported estimates of spillover parameters.

In order to check for a possible additional publication bias from editors and reviewers of journals and for the sake of comparison, Figure 3.2 depicts peer-reviewed studies only. In the event of additional bias, the entire distribution of the funnel plot in Figure 3.2 would move more to the right as compared to the funnel plot in Figure 3.1. However, except for the plots being heavier (Figure 3.1) and thinner (Figure 3.2), the shape of the funnel plots is comparable.

3.4.2 Meta-regression analysis

As indicated in Section 3.3.1, we need to move beyond eye-o-metrics and test econometrically for the existence and size of bias. Indeed, Doucouliagos et al. (2005) suggest that the appearance of a funnel plot can be deceiving, hence a more formal and objective statistical investigation is required as the presence of publication bias can be statically identified even if the plots more or less tend to be symmetrical. That means that the issue of publication bias cannot be simply investigated with graphical inspection, since its presence can still be possible with symmetrical funnel graphs.

3.4.2.1 Meta-significance test

Table 3.1 reports the results of the MST. When all observations of the primary studies are included, the estimated slope of the coefficients in the MEM is significant, indicating that there is a positive genuine empirical relationship between productivity spillovers and the presence of FDI in the host countries. Similar results are observed when only estimates from studies published in peer-reviewed journals are used. In both reported estimates, the findings appear to be consistent in that as sample size rises, the *t*-value of the estimated spillover effect increases. The estimated magnitude of the natural logarithm of the observation size (i.e., slope of the coefficient $lnSobs$ - β_1) is 0.122 (0.145 for peer-reviewed studies), indicating that there is a presence of publication bias in this literature in addition to a genuine empirical effect (note that both magnitudes of the slopes are < 0.5). In order to check for robustness of these results, the CDA reports evidence of publication bias in both when all studies and only peer-reviewed studies are considered (the magnitudes are slightly less than that of the MEM, but still between 0 and 0.5). In support of the visual inspection of the graphs, the MST of MRA offers robust evidence that the literature is contaminated with publication bias.

Table 3.1
MST-MRA, publication bias in FDI and productivity spillovers

Estimation Methods	*Variables*			
	Constant (B_0)	*lnSobs (B_1)*	*N*	*Studies*
Mixed-effects multilevel model (MEM)				
All studies	-0.566* (-1.78)	0.122*** (3.10)	1,231	65
Of which peer-reviewed	-0.614 (-1.54)	0.145*** (2.90)	693	41
Clustered data analysis (CDA)				
All studies	-0.428 (-1.13)	0.085* (1.77)	1,231	65
Of which peer-reviewed	-0.404 (-0.96)	0.095** (2.04)	693	41
Average				
All studies	0.026 (1.16)	0.380 (0.81)	53	53
Of which peer-reviewed	0.024 (0.99)	0.384 (0.59)	34	34

Note: The dependent variable is a natural logarithm of the absolute value of the *t*-values of the reported spillover estimates. ***, **, * stands for 1, 5 and 10% level of significance. *t*-values are given in brackets using robust standard errors. *N* denotes the number of reported FDI spillover estimates. The total number of observations (*N*) for all studies is 1,231 instead of 1,237 (693 for peer-reviewed studies instead of 698) since two t-stats (one t-stat for peer-reviewed studies) and four standard errors of the peer-reviewed estimated coefficients of spillover have zero values. The number of all studies is 65 instead of 69 (41 peer-reviewed studies instead of 43) as two peer-reviewed and two unpublished studies are identified as outliers. *MEM* estimated through the restricted maximum likelihood. *CDA* reports study-level clustered standard errors. The a*verage* regression replaces the full dataset estimates used in MEM and CDA with the one-estimate-one-study dataset computed through averaging all reported estimates in each study.

The slope of coefficients in the average dataset (one-estimate-one-study) estimates are not significant, indicating that there is no genuine empirical relationship between FDI and productivity spillovers. Corroborating the MEM and CDA analyses, the magnitudes of observation size from the average dataset suggest the presence of publication bias ($0.380 < 0.5$). However, it is important to note that using average estimates may result in losing important individual information within each primary studies. As a further robustness check, we report MST results from the inclusion of the outliers, as presented in Table 3.2. Overall, results are consistent with estimates that exclude the outliers (Table 3.1.), except now the magnitude of the observation size (B_1) shows a negative sign when the all studies are considered in the average dataset (but still suggests evidence of publication bias - $B_1 < 0$, i.e. $-0.027 < 0$). In sum, it is prudent to conclude that there is clear and robust evidence of publication bias in this literature whether we use the full dataset, the peer-reviewed dataset, or the one-estimate-one-study (average) dataset.

Table 3.2
MST-MRA, publication bias in FDI and productivity spillovers: Sensitivity analysis with the inclusion of outliers

Estimation Methods	*Variables*			
	Constant (B_0)	*lnSobs (B_1)*	*N*	*Studies*
Mixed-effects multilevel model (MEM)				
All studies	-0.610** (-2.27)	0.132*** (3.96)	1,448	69
Of which peer-reviewed	-0.991*** (-2.84)	0.197*** (4.45)	781	43
Clustered data analysis (CDA)				
All studies	-0.396 (-1.15)	0.084* (1.94)	1,448	69
Of which peer-reviewed	-0.419 (-1.08)	0.101** (2.31)	781	43
Average				
All studies	0.603* (1.98)	-0.027 (-0.63)	69	69
Of which peer-reviewed	0.406 (1.16)	0.009 (0.19)	43	43

Note see Table 3.1. The total number of observations for all studies is 1,448 instead of 1,450 (781 for peer-reviewed studies instead of 782) since two t-stats (one t-stat for peer-reviewed studies) of the estimated coefficients of spillover have zero values.

3.4.2.2 Funnel asymmetry test

The FAT-MRA for publication bias is reported in Table 3.3 for the full dataset, for estimates published in peer-reviewed journals and for the averaged dataset. When all studies are included in the specification, the MEM of regression (3.3) in Table 3.3 shows positive and significant publication bias. Also when only spillover estimates from published studies are considered, we detect positive and significant publication bias. Furthermore, to check for robustness, the CDA shows evidence of publication bias. Lastly, we analyse the primary studies' averages. In this case, we are left with a small number of observations (53 versus 1,233, Table 3.3 and 69 versus 1,450, Table 3.4 where we include outliers). Only when we include outliers (Table 3.4), we do find significantly positive publication bias. However, recall that the simple average of the primary studies may lead to biased estimates as it fails to take advantage of important within-study information (Stanley and Doucouliagos, 2012). The evidence of publication bias is consistently significant and positive in all the specifications reported. So, in support of the visual inspection of funnel diagrams and the objective MST, the FAT-MRA also shows clear evidence of publication bias: the productivity spillover effects from FDI are significantly overstated in the literature.

Table 3.3
FAT-MRA, publication bias in FDI and productivity spillovers

Estimation Methods	*Variables*			
	1/SE	*Publication bias*	*N*	*Studies*
Mixed-effects multilevel model (MEM)				
All studies	-0.006 (-1.16)	1.054** (2.20)	1,233	65
Of which peer-reviewed	-0.011 (-1.11)	1.335* (1.76)	694	41
Clustered data analysis (CDA)				
All studies	0.0004 (0.06)	0.505** (2.07)	1,233	65
Of which peer-reviewed	-0.0005 (-0.02)	0.572* (1.77)	694	41
Average				
All studies	0.026 (1.16)	0.380 (0.81)	53	53
Of which peer-reviewed	0.024 (0.99)	0.384 (0.59)	34	34

Note: The dependent variable is the t-values of the reported spillover estimates. **, * stands for 5 and 10% level of significance. *N* denotes the number of spillover estimates. *t*-values are given in brackets using robust standard errors. The total number of observations (*N*) is 1,233 instead of 1,237 (694 for peer-reviewed studies instead of 698) since four peer-reviewed spillover estimates have zero standard errors. The number of all studies is 65 (41 peer-reviewed studies) as two peer-reviewed and two unpublished studies are identified as outliers. *MEM* - estimated through the restricted maximum likelihood. *CDA* reports study-level clustered standard errors. The a*verage* regression replaces the full dataset estimates used in MEM and CDA with the one-estimate-one-study dataset computed by averaging all reported estimates in each study.

Regression (3.3) can also be used to examine whether journal reviewers and editors, while selecting and accepting papers, are a source of publication bias. In column 3 of Table 3.3, the magnitude of publication bias is reported. This column provides evidence of more publication bias for studies published in a peer-reviewed journal. However, this publication bias is not statistically different from the publication bias of all studies. In other words, except from self-censorship, primary studies are not affected by an additional pressure from journal reviewers' and editors' tendency to select positive and significant findings. In light of this, the magnitude of publication bias ranges from 0.505 to 1.335. In line with review by Doucouliagos and Stanley (2013), the size of publication bias found in this study is substantial (using the preferred multilevel model as it accounts for both within and between study variations). In this case, the previous MRA reported faulty inference, in that the authors exaggerate the underlying genuine spillovers effect from FDI. Such faulty inference can make the size of the productivity spillovers effect appear substantially much larger than the actual effect, which may be little or non-existent.

Table 3.4
FAT-MRA, publication bias in FDI and productivity spillovers: Sensitivity analysis with the inclusion of outliers

Estimation Methods	*Variables*			
	1/SE	*Publication bias*	*N*	*Studies*
Mixed-effects multilevel model (MEM)				
All studies	-0.000 (-0.28)	0.877** (2.19)	1,446	65
Of which peer-reviewed	-0.000 (-0.61)	1.018 (1.63)	778	41
Clustered data analysis (CDA)				
All studies	0.000 (0.35)	0.525* (1.76)	1,446	65
Of which peer-reviewed	-0.000 (-1.23)	0.565 (1.10)	778	41
Average				
All studies	-0.000 (-1.41)	1.066 ** (2.54)	69	69
Of which peer-reviewed	-0.000 (-1.22)	1.227 * (1.89)	43	43

Note: see Table 3.3. *N* is 1446 instead of 1450 (778 for peer-reviewed instead of 782) since four standard errors of the estimated spillovers have zero values.

3.4.2.3 Cumulative funnel asymmetry test

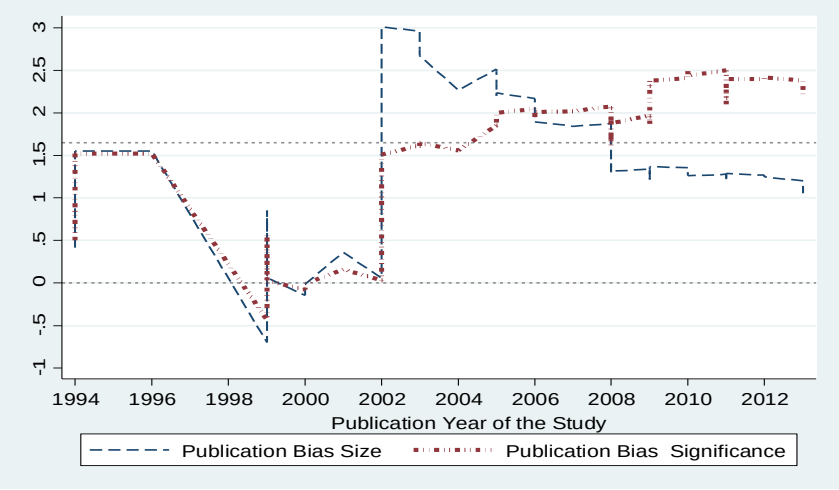
This section explores whether the publication bias identified above is time varying (i.e., whether it alters in relation to the publication year of the studies). We will try to establish when publication bias started to be significant in the spillover literature or, alternatively, when publication bias disappeared from the literature. We follow a similar approach as Doucouliagos (2005) for publication bias in relation to economic growth and economic freedom. To investigate this issue, we apply the FAT-MRA equation (3.3). We start with the earliest primary study (that allows for a minimum number of observations for regression) and add primary empirical studies one by one in chronological order (i.e., according to the year and month they were published) and re-estimate the FAT for every study in order. Figure 3.3 reports the results of this exercise, plotting the estimated size of the publication bias and its *t*-statistic.

Figure 3.3 illustrates that until around 2003 (i.e., the 121st reported estimate), the estimated coefficient (2.748) of the publication bias was not statistically significant (at 10 per cent significance level). Publication bias then briefly became statistically significant at the 90 per cent confidence level (where it touches the horizontal short dash line) for the 129th reported estimate in that year (t=1.65). It became again insignificant in the year 2004 for the 165th reported estimate (t=1.56). Since 2005 (around the

189th reported estimate), publication bias has remained statistically significant with t=1.85 and increasing to t=2.20 at the end of 2013.

In terms of the size of the bias, it briefly reached a maximum at about 2.673 in the year 2003 when it became statistically significant for the first time. Although since then it has continuously declined, it has never become insignificant and smaller than one, suggesting that the evidence of publication bias in this literature is robust. Eventually, there is an estimated publication bias coefficient of 1.1 (t=2.2) for the full dataset of 1,233 reported estimates. Figure 3.3 also shows that the publication bias can be drawn from the majority of the reported estimates as the median estimate appeared in 2008 whereas statistical significance was permanently established in 2005.

Figure 3.3
Cumulative FAT plots in chronological order of the publication year: all studies



Source: The 1,233 reported estimates from 65 studies.

Note: The upper horizontal short dash line indicates the t-statistic that the estimated cumulative publication bias (FAT) is statistically significant at least 10% significance to visualize the statistical relationship between the estimated size and its t-statistic.

3.5 Conclusions

The effect of FDI on host countries has attracted substantial attention, not only from an academic point of interest but also from a policymaking perspective. A growing area of research in this field is the effect on

productivity spillovers. This chapter offers a meta-analysis of intra-sectoral FDI productivity spillover effects for publication bias. We gather 1,450 reported productivity spillover effects from 69 primary studies covering 31 developing countries published from 1986 to 2013. We explore the issue of publication bias by means of visual inspection of funnel plots, statistical MRA of MST and FAT. When all the reported estimates of productivity spillovers are pooled and averaged, in accordance with the seminal findings by Görg and Strobl (2001) and contrary to Iršová and Havránek (2013) and Mebratie and van Bergeijk (2013), this study uncovers the existence of publication bias. We also add the extent of the publication bias.

Reported estimates are significantly overstated, and on average too many positive results have been reported and published. In this context, the primary studies exaggerate the underlying genuine magnitude of the spillover effects and hence the existence of such bias makes it difficult to compute the underlying genuine spillover effects from a simple arithmetic average of all available estimates. The chapter also explores whether the issue of publication bias is different between all reported estimates, and explores spillover effects that are reported only in studies published in peer-reviewed journals as well as averaged estimates across each study. It appears that in both the all reported estimates and peer-reviewed estimates the literature is tainted with publication bias. However, we do not find an additional publication bias from journal editors and reviewers except via self-censorship for studies published in peer-reviewed journals. In addition, the averaged dataset does not appear to show the absence of publication bias. Hence, from a policy point of view, it makes no difference whether policy-makers focus on all reported estimates, only on estimates published in peer-reviewed journals, or on averaged estimates. The publication bias appeared in the literature temporarily in 2003 and became permanently established in 2005.

Beyond the issue of publication bias, researchers and policy-makers are interested in the underlying magnitude and sign of the productivity spillover effect from FDI. Hence, it is important to explore whether the literature suffers from publication bias, and if so, to what extent in order to estimate a genuine empirical spillover effect corrected for this bias. The question is how can we best estimate the magnitude of a genuine spillover effect when the literature contains evidence of substantial publication bias. The next chapter explores this and other related questions.

Notes

[1] This chapter is also partly available as a conference proceeding at the 1st IGAD Economic Conference, 2014 which contains limited parts from the article published in the *Journal of Economic Surveys*.

[2] The 74 primary studies we have collected all define a foreign-owned firm as a firm that has at least 10 per cent foreign ownership.

[3] The reference lists of existing systematic review and meta-analysis, as well as recent primary empirical studies and narrative literature, are carefully referenced.

[4] Getting the minimum estimation report from a non-English translation may not be enough for a clear understanding of the studies which is the crucial aspect of a meta-analysis (Stanley and Doucouliagos 2012). In fact, we have found one non-English paper by Sonia (2006) entitled Revaluando la transmisión de spillovers de la IED: Un estudio de productividad para Colombia (channels for FDI spillovers: A productivity study for Colombia). Even though the author provides the abstract in English, the information in the abstract was found to be far from enough to complete the data extraction template which compels us to understand the literature from inside out.

[5] Primary studies that deal with determinants, descriptive and qualitative evaluation of intra-industry FDI productivity spillovers are excluded from the analysis. In addition, studies that are not downloadable are also excluded, though we often attempted to approach the authors of these studies if contact address was available. For example, apart from the abstract, the article by Sasidharan and Ramanathan (2007) is not accessible online. We included this article after contacting the authors. Conversely, a working paper by Demmel et al. (2013) 'Innovation and productivity: evidence for 4 Latin American countries manufacturing industry (No. 1307)' was found to be inaccessible with no contact address and was thus excluded.

[6] Inter-industry studies are presumed to be too dissimilar to pool sensibly with intra-sector studies (Wooster and Diebel, 2010).

[7] A similar approach is used by Feld and Heckemeyer (2011) and Iršová and Havránek (2013). For instance when a double-log form is used, the sample mean for spillovers variable needs to convert into a semi-elasticity (i.e., $b/\bar{X}$) as in:

$$\log Y_i = a + b \log X_i + u_i$$

[8] These include Blomström and Persson (1983), Kokko et al. (1996), Kokko et al. (2001), Takii (2005), and Kathuria (2010).

[9] Out of the full dataset estimates, 16 appeared to be larger than 10 in absolute value. Some meta-analysts like Iršová and Havránek (2013) and Mebratie and van Bergeijk (2013) consider these large estimates to be outliers, leading them to exclude these estimates from their main analyses. Other meta-analysts like Stanley and Doucouliagos (2012), however, argue that unusually large estimates may be the

result of errors in coding the parameters. However, after a suspicious double checking, reported spillover estimates continue to differ largely.

[10] Indeed, to the best of our knowledge, Light and Pillemer (1984) were the first to use the funnel plots to assess and detect whether empirical research suffers from the presence of publication bias.

[11] Modelling publication bias starts with switching the axes of the funnel plot, so that the estimated spillover effect is the dependent variable on the vertical axis and its estimated standard error is the explanatory variable on the horizontal axis. This transformation of the funnel plot provides the intuition of the MRA (Ashenfelter et al., 1999; Card and Krueger, 1995; Roberts and Stanley, 2005; Stanley et al., 2010). To see the graphical derivation of MRA, first take the funnel plot described in Section 3.3.1 above. Second, invert the funnel by plotting *Se* on the vertical axis. Third, reverse the axes (i.e., rotating the funnel 90 degree) and interpret the funnel plot as illustrated in equation (3.2).

[12] The reasoning behind this is that empirical studies can use different econometric techniques, sample sizes and specifications; equation (3.2) is likely to be measured with a problem of heteroscedasticity, i.e., the error term, u_{ij}, is not expected to be independently and identically distributed (Stanley and Doucouliagos, 2012). Note that in equation (3.2) the independent variable (standard error), Se_{ij}, is the error of the dependent variable (the reported spillover effect), $effect_{ij}$, thus the variance of $effect_{ij}$ will vary from one estimate to the next (Stanley, 2005; Stanley and Doucouliagos, 2012). This should therefore be measured with WLS, i.e., dividing equation (3.2) by the individual standard error, Se_{ij}.

[13] Note that the coefficients of the intercept and the explanatory variable are interchanged and the independent variables are the inverse of its standard error which may now be estimated by ordinary least squares (OLS) (see also Stanley, 2005). Due to the fact that this method is transformed from the funnel plot, the procedure is known as FAT (Roberts and Stanley, 2005).

[14] This is because, if the issue of within study dependence in one's MRA is not correctly removed, a meta-regression can result in standard error and *t*-statistics being calculated incorrectly and this can give a false appearance of the statistical significance level of estimated coefficients (Stanley and Doucouliagos, 2012). Consequently, whether we use study-level clustered standard error or conventional standard error, the results of the estimated coefficients should be identical.

[15] According to Doucouliagos et al. (2005) and Stanley (2008), when spillover effects show statistically significant results are chosen irrespective of the direction of the effects or both statistically significant negative and positive findings have equal reporting preference, the funnel plots are likely to be a symmetric funnel graph, but hallow and excessively wide.

4 Productivity spillover effects from FDI in developing countries: A meta-analysis of the micro-econometric literature[1]

[1] The Chapter is based on an article published in 2017 in *Journal of Economic Surveys* co-authored with Peter van Bergeijk.

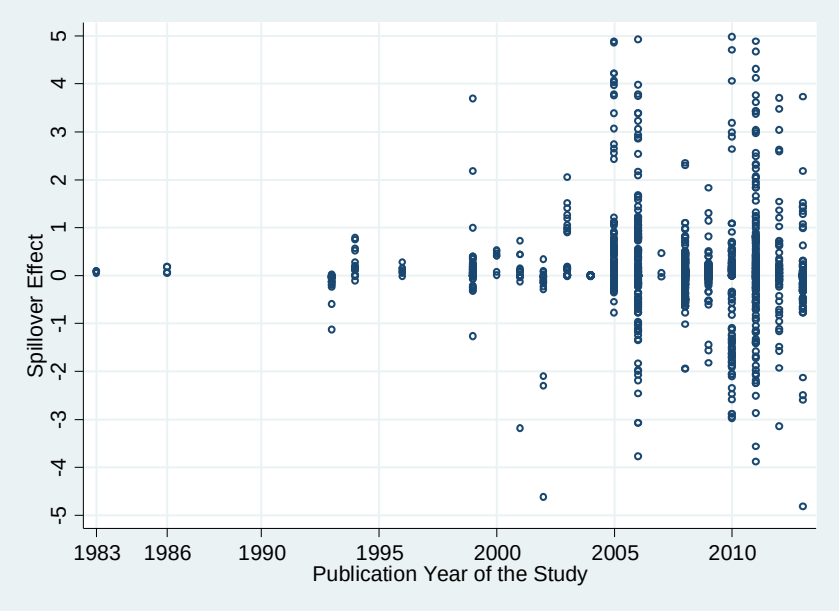
Abstract

This meta-analysis reviews the intra-sector heterogeneity of productivity spillovers and the genuine underlying empirical effect from FDI in 31 developing countries through a larger more comprehensive dataset. We investigate how the inconsistencies in the reported spillover findings are affected by publication bias, characteristics of the data, estimation techniques and empirical specification, analyzing 1,450 spillover estimates from 69 empirical studies published in 1986 - 2013. In combination with model misspecification of the primary studies, the publication bias identified in Chapter 3 overstates the genuine underlying meta-effect, but the meta-effect remains economically and statistically significant. Our results emphasize that spillovers and their sign largely depend systematically on the specification characteristics of the primary studies and publication bias. Publication bias is not caused by 'best practice' choices. Future research needs to cover more developing countries and to investigate not only whether spillovers occur, but also to explore inside the black box of how spillovers actually emerge.

4.1 Introduction

Developing countries increasingly use policies to attract FDI and often provide substantial incentives. Almost 90 per cent of the national regulatory investment regime changes introduced in more than 100 countries in 1991-2012 offer more favourable conditions for FDI (UNCTAD, 2013). One driver behind the FDI-friendlier regimes is the expectation that FDI inflows indirectly boost the productivity of domestic firms. FDI is assumed to transfer knowledge of processes and products (so-called productivity spillovers) and this may enhance the technological capabilities of domestic firms (Wooster and Diebel, 2010).

Figure 4.1
FDI spillover effects by the year of the publication: 1983-2013 (N=1545)

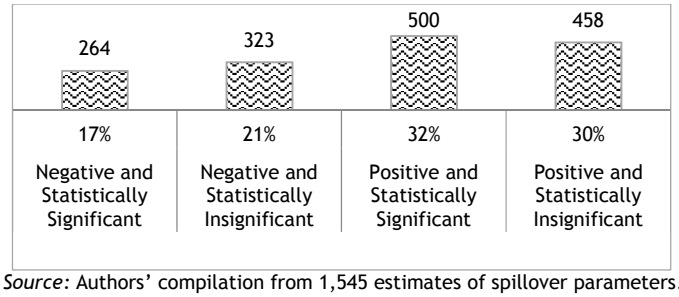


Source: Authors' compilation from 74 studies reported in the literature.

An important question is whether FDI actually generates productivity spillovers in the context of developing countries: the empirical evidence is inconclusive and contradictory. Figure 4.1 illustrates the extent of empirical disagreement of the reported effect size for the 74 primary studies that

we collected using the MAER-Net recommendations. These studies were published in 1983-2013 by 96 researchers, deal with 31 developing countries and provide 1,545 estimates of spillover parameters. Figure 4.2 presents details of the distribution and disagreement of these estimates in terms of direction and significance. Approximately, only one-third of the empirical estimates validate a significantly positive effect. About half the spillover estimates are insignificant; whereas one in six find a significantly negative effect. It should be noted that while we refer to this field as findings regarding developing countries, these studies (and thus our findings) are not necessarily representative for the group of developing countries. The reason is clear: the productivity spillovers of FDI have not yet been investigated for a sufficiently large group of developing countries to make such claims.

Figure 4.2
FDI spillover effects reported in 74 studies published in 1983-2013 (N=1545)



Source: Authors' compilation from 1,545 estimates of spillover parameters.

This chapter aims to estimate the size, sign and significance of the productivity spillover effect and to analyse the determinants behind the heterogeneous results of the primary empirical studies. We demonstrate application of the reporting guidelines of the MAER-Net required by the *Journal of Economic Surveys* for conducting meta-analysis. We use meta-analysis to combine, summarize and investigate the reported productivity spillover estimates. Meta-analysis is a statistical approach to analyse an existing literature of reported empirical findings for a similar hypothesis, research question, empirical effect and/or phenomenon (Stanley and Doucouli-

agos, 2012). Unlike qualitative reviews (e.g., Fan, 2002), meta-analysis enables us to filter out publication bias and misspecification and to estimate the genuine spillover effect.

To date, five relevant meta-analyses of productivity spillovers and FDI have been published: Görg and Strobl (2001), Meyer and Sinani (2009), Wooster and Diebel (2010), Iršová and Havránek (2013) and Mebratie and van Bergeijk (2013). In this chapter, we use an enriched version of the dataset in Chapter 3 and Demena (2015), covering more than 40 potential research dimensions (including data characteristics, estimation techniques and empirical specifications) and four categories of journal and study qualities. While we add many potentially explanatory variables to provide a comprehensive test, we also enforce limitations. In particular, we focus on developing countries, because pooling developing and developed countries is inappropriate (Wooster and Diebel, 2010).

Our meta-analysis comprises all observations that investigated intra-sector spillovers from FDI for developing countries, providing a more comprehensive version of previous meta-analyses. This potentially leads to a better reliability of the findings and helps us to investigate whether the selection of studies has an impact on bias; a topic not researched in previous meta-analyses of FDI spillovers. Indeed, firstly, the latest studies have suggested that publication bias was not a problem for this literature, but we uncover clear evidence of publication bias in our larger sample (Chapter 3 of this thesis; Demena, 2015). Secondly, in this chapter, we show that the spillover effects in the primary studies overstate the magnitude of the genuine empirical effect that remains economically important after controlling for selection bias and misspecification. However, Iršová and Havránek (2013), analyzing 1,205 observations from 52 studies for the period 2002-2010 dealing with both developing and developed countries, conclude that spillover effects are indistinguishable from zero after controlling for the absence of publication bias in this literature.[2]

The remainder of the paper is structured as follows: Section 4.2 starts with the primary studies. Section 4.3 discusses the data and the empirical approach. Section 4.4 presents detailed results. Section 4.5 concludes and suggests lessons for future research.

4.2 Review of the literature

Many studies deal with productivity spillovers from FDI. We organize the literature by decades in order to illustrate changes over time in spillover findings and study characteristics.

4.2.1 1980s: positive spillover effect in cross-sections

The first empirical study for developing countries was by Blomström and Persson (1983). They study Mexican plants and report that FDI has a significantly positive effect on the productivity of domestic firms. Blomström (1986) – also for Mexican firms – found a similar effect. These studies used industry-level cross-sectional data, and thus face an identification problem. Firstly, given the assumption that foreign firms are more productive and more technologically advanced, industry-level aggregated data that include foreign firms in the aggregate regression create an upward spillover effect - aggregation bias. Secondly, if FDI gravitates towards productive industries, then the observed spillover result from cross-sectional data will overstate the impact of foreign firms due to potential endogeneity of FDI. Thus, it is unclear whether the evidence is due to the presence of FDI or the own productivity of domestic firms.

4.2.2 1990s: emerging contradictory evidence

An important study is the first use of panel firm-level data (Haddad and Harrison, 1993) with insignificant productivity spillover for Morocco. Aitken and Harrison (1999) report negative effects for Venezuela. The former attributed the absence of spillovers to the technological gap between domestic and foreign firms; the latter concluded that the positive effect reported in the previous studies was due to the tendency of foreign firms to invest in productive industries. In contrast, Kokko (1994, 1996) for Mexico, Blomström and Sjöholm (1999), Sjöholm (1999a, 1999b) for Indonesia, and Chuang and Lin (1999) for Taiwan report positive productivity spillovers. These studies continued to rely on cross-sections although panel data are better to test the validity of spillovers, enabling control for the behaviour of firms over time.

4.2.3 2000s: continued contradiction

The studies of the 1980s and 1990s use a pipeline model: they presume that spillovers are independent of domestic firms' capabilities. In the 2000s, a shift occurs towards the domestic capability model. This new strand of the literature assumes that spillovers do not occur automatically, but may depend on the capabilities of domestic firms. As illustrated in Figure 4.1, the body of evidence increased substantially over time, possibly due to the growing availability of datasets. The findings, however, remain contradictory. Blyde et al. (2004) for Venezuela, Bwalya (2006) for Zambia, Marin and Bell (2006) and Chudnovsky et al. (2008) for Argentina, and Mebratie and Bedi (2013) for South Africa did not find any spillovers. Jordaan (2008a, 2008b) for Mexico and Waldkirch and Ofosu (2010) for Ghana find negative FDI effects. In contrast, studies on Asian countries report positive spillovers (Taymaz and Yilmaz, 2008 for Turkey, Nguyen, 2008 for Vietnam, Khalifah and Adam, 2009 for Malaysia).

4.2.4 Trends

Figure 4.1 illustrates substantial variations in the reported estimates over time with an increasing trend, in particular since the mid-2000s. Over the past three decades, the number of estimates has continuously increased: about 71 per cent of the estimates are from studies published after 2005.

Moreover, the initial results from studies using cross-sectional data were challenged by subsequent panel data studies. This suggests an association of cross-section studies and positive findings, and negative or insignificant findings and panel studies. Panel studies by Aitken and Harrison (1999) for Venezuela report negative effects, whereas Haddad and Harrison (1993) for Morocco, Blalock and Gertler (2008) for Indonesia, and Mebratie and Bedi (2013) for South Africa report no effects. However, recent panel studies (e.g., Kee, 2005 for Bangladesh; Takii, 2009 for Indonesia; Van Thanh and Hoang, 2010 for Vietnam) find positive effects. It appears likely, therefore, that the dichotomy of cross-section and panel data findings has become less clear (see also, Jordaan, 2012).

Importantly, the primary studies include a proxy for the extent of foreign presence. Theoretically, productivity spillovers are assumed to occur through the transmission channels of demonstration, labour mobility, and competition effects (Crespo and Fontoura, 2007; Javorcik, 2004a; Jordaan,

2012). Unfortunately, the existing empirical work fails to identify the channels underlying the spillovers and instead merely focuses on whether the presence of foreign firms influences the productivity of domestic firms. Thus, there is a gap between theory and empirical analyses.

Furthermore, the empirical studies largely ignore the heterogeneity of both the absorptive capacity and the technological levels of domestic firms (only 10 per cent of the studies in the meta-dataset control for these factors). Clearly, general spillovers cannot exactly indicate how spillovers occur and which domestic firms gain. Some may experience positive impacts, others nothing or even negative impacts. For example, firms with a relatively higher technological level can benefit from spillovers via the competition and/or demonstration effects, while firms with a lower technological level may not be in a position to compete or imitate (Hamida, 2013) and may instead benefit from labour mobility.

Thus, the relative importance of the spillover channels varies with the existing firm-specific characteristics of domestic firms. Consequently, future investigations of overall spillover effects need to discern the transmission channels by employing various spillover control variables. This would be important to accurately describe and identify the impact of spillover processes, and hence to narrow the heterogeneity of spillover estimates and also to guide policy-makers towards relevant channels.

4.3 Data and empirical approach

In order to econometrically analyse the sources of heterogeneity and to understand whether FDI generates productivity spillovers, we reviewed existing meta-analyses and primary empirical studies (and their references) as the basis for our literature search. Our search and review of the existing empirical studies aimed to identify all relevant English language unpublished and published studies regarding developing countries.

4.3.1 Methods, protocols and data construction

In identifying the relevant studies, coding variables and data construction, we follow the MAER-Net prescriptions (Stanley et al., 2013). We identified our relevant primary studies in an extensive search using Google Scholar, EconLit and Scopus. The World Bank (2012) database that provides empirical studies conducted using the enterprise survey data was also examined in detail. The search included all potentially relevant published

and unpublished empirical studies from 1983 to 2013 for developing countries.

We searched using the broad keywords: 'FDI presence effect on host economy', 'technology transfer+foreign firms', 'productivity spillover+FDI', and 'productivity spillover+FDI+developing countries'. For example, the keyword 'productivity spillover+FDI+developing countries' using the Scopus search engine provided 1,026 records to review. Examinations of titles, abstracts and keywords were followed by inspection of introductions and conclusions, yielding 233 prospective studies.

Studies were included if they satisfy the following criteria for detailed review: English language empirical micro-econometric studies that study intra-industry spillover effects and report regression-based coefficients, sample size, t-statistics or standard errors. The imposition of these criteria resulted in a dataset of 74 studies dealing with 31 developing countries for coding. Before transferring the data to a Stata file for analysis, a template for data extraction was designed in Microsoft Excel format. Data on various characteristics of the empirical studies such as spillover measures and effects, data type, estimation techniques, and study control variables were collected. We conducted extensive coding of the study characteristics in order to avoid subjectivity and increase the robustness and the reliability of the findings. A second reviewer independently checked the consistency of the data and coding with an initial data collection and coding disagreement rate of 2.9 per cent. After double-checking initial data, consensus was reached. To ensure comprehensiveness of the dataset, the multiple search process took five months (May – September 2013).

It is worthwhile to describe some critical aspects encountered during this process. Multiple estimates are a common standard in economics. This is partly due to the demand from editors and reviewers that applied econometric studies should report multiple models, methods and estimates to ensure robustness (Stanley and Doucouliagos, 2012). This may lead to a best-set, average-set or all-set meta-data.[3] Following Stanley (2001), mainly to avoid giving undo weight to a single study, many meta-analysts use either the 'best' estimate or the average estimate. In the latter case, however, it is impossible to analyse the impact of different estimation techniques, estimation samples and models. Moreover, we may lose important within-study information if we use average estimates. Importantly, choosing the 'best' estimate may introduce subjectivity. First, in most cases, authors do not explicitly indicate their best estimate. Second, if they

do, the author's preference may introduce selection bias. Third, estimates in a comprehensive single paper can be underweighted relative to estimates by researchers who publish a large number of closely related articles, as each would count as an individual study to be included as a best-set estimate (Stanley, 2001). For these reasons, we adopt the all-set estimates.

The majority (86 per cent) of the reported estimates use a log-linear form, with productivity proxies expressed in logs and FDI linearly: the regression coefficients are semi-elasticities, and the standard errors are directly derived from the regression coefficients. However, when models were estimated using the double-log or linear form, we had to re-calculate the effect size by using sample means (see Gujarati and Porter, 2009). We contacted authors when sample means, observation size, t-values or standard errors were not reported in the primary studies and when we needed clarification of the models, methods and estimates. We have also collected estimates for interaction variables (see Section 4.3.2). Five studies (95 parameter estimates) were excluded because the authors were unwilling or unable to provide missing data (note that Figures 4.1 and 4.2 have been based on the full sample of 74 studies).

4.3.2 Meta-dataset

Our dataset consists of 69 primary studies for which the required data are available (1,450 observations). These studies deal with 31 developing countries and were published in 1986-2013. The median number of parameter estimates in a primary study in our sample is 11 estimates. The mean and maximum are 21 and 100 estimates, respectively.

For each empirical study, we coded more than 40 potential research dimensions, and four categories of publication qualities. The dataset includes 43 peer-reviewed journal articles and 26 working papers, dissertations, book chapters, unpublished studies or reports. The oldest study was published in 1986, and the median study appeared in 2008. Half of the research in question was published in the last five years: this topic is very lively and many new investigations have appeared.

To put these figures into perspective: Nelson and Kennedy (2009) summarize and assess 140 meta-analyses in economics conducted since 1989. They report that the average number of parameter estimates included was 191, the median was 92, and the largest number of parameter estimates was 1,592. The average and the median of primary studies reviewed were

42 and 33, respectively. The mean and median of explanatory variables included were 14 and 12, respectively. The maximum number of control variables was 41. Therefore, compared to other meta-analyses in economics, the current dataset can be regarded as quite comprehensive.

Out of the 1,450 spillover estimates, 16 are found to be larger than 10, in absolute value. Some meta-analysts (Iršová and Havránek, 2013; Mebratie and van Bergeijk, 2013) consider that these large estimates are outliers which led them to exclude these estimates from the main analysis. Others, like Stanley and Doucouliagos (2012), however, argue that unusually large estimates may be due to coding errors. In our case (after double-checking by a second independent reviewer), the reported spillovers appear to be genuine. Therefore, we applied the multivariate outlier method proposed by Hadi (1994) in order to use spillover estimates along with their precision to identify outliers jointly. We identify some 14 per cent of the observations as outliers. Slightly more than 70 per cent of the outliers have been published in either journals with a zero 5-year impact factor (source: 2013 ISI impact factor) or are from unpublished studies. Some meta-analysts have argued that better ranked journals can be expected to publish articles that use better methods, and thus produce more reliable findings (Disdier and Head, 2008; Havránek and Iršová, 2011). If this is the case, then these outliers may represent lower quality research as compared to the non-outliers. In this paper we report the findings without outliers, but note that the inclusion of outliers yields similar findings.

4.3.3 Weighted average effect and genuine effect

We start with the computation of the weighted average spillover effect:

$$effect_w = \frac{\sum effect_{ij} N_{ij}}{\sum N_{ij}} \quad (4.1)$$

where $effect_{ij}$ is the reported effect of the i^{th} estimate from the j^{th} study with N_{ij} its associated sample size as weights. Copper and Hedges (1994) suggest using the inverse of the variance weights. However, Adams et al. (1997) argue that the estimates derived from large samples are more precise, and thus should receive a larger weight. Hunter and Schmidt (2004) and Schulze (2004) also recommend the use of sample size to weight the effect size.[4] Accordingly, the weighted average spillover effect is 0.16 (statistically significant at a 95 per cent confidence interval: 0.105 - 0.238).

Thus, FDI would seem to have a significant positive effect on productivity spillovers.

The next step is to assess whether the overall effect is genuine or influenced by publication bias. In order to estimate the size and significance of the genuine effect, we use funnel plots to get a first indication of the extent and direction of this effect. In the absence of publication bias, reported spillover estimates will vary randomly (symmetrical) around the genuine spillover effect. However, this method is only based on visual inspection, and thus prone to subjective interpretation, and therefore unconvincing or deceiving (and also cannot provide the statistical significance of the effect). As in equations (3.2) and (3.3) in Chapter 3, a powerful statistical method is the meta-regression model (MRM) that adjusts potential heteroscedasticity, hence measured with WLS version:

$$t_{ij} \equiv effect_{ij}/Se_{ij} = \beta_1 + \beta_0(1/Se_{ij}) + e_{ij} \ldots\ldots\ldots\ldots\ldots\ldots \quad (4.2)$$

As in Chapter 3, t_{ij} is the t-stat of the reported spillovers effect ($effect_{ij}$) of the i^{th} estimate from the j^{th} study and $1/Se_{ij}$ is invers of its standard error or its precision. The slope of equation (4.2) (i.e., B_0) estimates both the size and direction of a genuine effect (the precision-effect test, PET) and the intercept term (i.e., B_1) is the magnitude of publication bias (FAT).

It is important to account for within-study dependence, as multiple estimates from the same studies are unlikely to be statistically independent; Bateman and Jones (2003) and Doucouliagos and Laroche (2009) recommend the use of a MEM (hierarchical model). We prefer the MEM model that accounts for both within and between study variations (see Doucouliagos and Laroche, 2009; Havránek and Iršová, 2011). In this respect, the overall error term (e_{ij}) comprises of the study-level random-effects and measurement error disturbance term.[5] Furthermore, we test the robustness of our results by excluding unpublished papers and interaction variables, and by applying CDA. All WLS estimations use either inverse variance or sample size weights.

4.3.4 Explaining heterogeneity

Table 4.1 lists the potential sources of heterogeneity of the findings in the primary studies that include means and standard deviations. The choice for these variables is based on the discussion of the literature as well as the

meta-data at hand. Following the debates in the empirical studies and the approach presented by previous meta-analyses (e.g., Iršová and Havránek, 2013) we report four categories of potential sources of heterogeneity: data, estimation, specification, and publication characteristics.

Data characteristics: We construct dummy variables for the time dimension of the data: panel versus cross-section and the time span (length) of the data, and for the level of observation/aggregation: firm-level (micro-data) versus aggregated industry-level. We consider the number of observations of the data to test for systematic variation between small and large samples. Finally, we included a dummy variable for the data source (World Bank enterprise survey versus national statistics bureaus).

Estimation characteristics: Roughly, 40 per cent of the studies estimate spillovers using a two-step process with total factor productivity (TFP) as the dependent variable.[6] The other studies employ a one-step procedure based on labour productivity, output or value-added. We include a dummy variable for the one-step estimates. Next, we control how TFP is computed: Olley-Pakes (OP, 1996) or Levinsohn-Petrin (LP, 2003) versus OLS, Fixed-effects or other methods to consider the endogeneity of inputs. We also include dummies for the spillover estimation techniques (OLS, Fixed-effects (year, sector, both) or other techniques and for regressions estimated in differences), and the functional form of the models: linear or double-log versus log-linear.

Specification characteristics: Empirical studies use several proxy measures for foreign presence in terms of employment, capital, or output share. In our data, the majority of the studies use output or sales (47 per cent) and employment specifications (35 per cent). Most primary studies report estimates related to contemporaneous spillovers, while only a few estimate lagged effects, and thus we control for lagged or contemporaneous estimates. Finally, to observe any systematic difference between the theory of the pipeline model and the domestic capability model, we construct dummies for the inclusion of control variables like absorptive capacity, technological gap, exports, and firm size.

Publication characteristics: We also control for study and journal qualities to test if publishing in a peer-reviewed journal is systematically associated with the reported spillover estimates. We construct dummies for the inclusion of publication in a peer-reviewed journal and use author citations in Google Scholar as well as an international journal ranking for development studies.[7] Finally, we control for the publication year of the study.

Table 4.1
Definition and descriptive statistics of explanatory variables

Moderator Variables	*Definition*	*Mean*	*Standard deviation*
1/se	Precision of estimated spillover	30.458	56.276
	Data Characteristics		
Panel data	=1 if panel data are used (cross-sectional data is the base)	0.726	0.446
Firm-level	=1 if firm-level data are used (industry-level data is the base)	0.929	0.256
Data source	=1 data from the World Bank (national statistics as a base)	0.815	0.388
Time span	The number of years of the data used	5.957	3.702
No. of firms [a]	Sample size/time span	2.130	3.246
Balanced data	=1 if balanced dataset is used	0.145	0.352
	Estimation Characteristics		
Linear/Log-log	=1 a specification different from log-level	0.120	0.326
Differences	=1 if the regression is estimated in differences	0.131	0.338
Year fixed effects	=1 if year fixed effects are included	0.564	0.496
Sector fixed effects	=1 if sector fixed effects are included	0.580	0.494
OLS	=1 if OLS used for spillover estimations	0.398	0.490
	(random-effects, GMM, WLS and others as a base)		
Fixed-effects	=1 if fixed-effects used for the estimation of spillovers	0.269	0.444
One-step estimations	=1 if spillovers are estimated in one-step	0.554	0.497
OP-LP	=1 if TFP estimated using the OP-LP method	0.297	0.457
	Specification Characteristics		
EmploymentFDI	=1 if proxy for foreign presence is employment	0.352	0.478
Equity FDI	=1 if proxy for foreign presence is equity	0.178	0.383
Technological gap	=1 if specification controls for technology gap	0.097	0.295
Absorptive capacity	=1 if the specification controls for absorption capacity using R&D expenditure or percentage of a firm's workers with college or higher degrees or employees training programme	0.202	0.402
Firm size	=1 if the specification controls for firm size	0.333	0.472
Exports	=1 if the specification controls for exports	0.205	0.404
All firms	=1 if domestic and foreign firms included in the regression	0.337	0.473
Lagged spillover	=1 if the coefficient represents lagged foreign presence	0.105	0.306
Interaction terms	=1 if the coefficient comes from interaction variables	0.161	0.368
	Publication Characteristics		
Publication date	The publication year of the study (base, 1986)	21.883	3.985
Published	=1 if the study was published in a peer-reviewed journal	0.563	0.496
Study citations	Study citations in Google Scholar per age of the study	8.174	25.026
Journal rank	=1 if published in high journal rank, 2013 ISI impact factor	0.325	0.468

[a] Mean and standard deviation are divided by a thousand to make the figures easier to read.

To investigate the heterogeneity in the reported spillover estimates, we expand equation (4.2) to include the moderator variables X_{kij}:

$$t_{ij} \equiv effect_{ij}/Se_{ij} = \beta_1 + \beta_0(1/Se_{ij}) + \alpha_k X_{kij}/Se_{ij} + e_{ij} \ldots \quad (4.3)$$

Following the MAER-Net reporting guidelines, equation (4.3) is estimated using the general-to-specific (GETS) modelling approach. GETS modelling starts with a specification in which all potential moderator variables are included in the general specification (4.3). Next, the statistically most insignificant variables are removed, one at a time, until we arrive at a reduced/specific specification that contains significant variables only (Abdullah et al., 2015; Charemza and Deadman, 1997; Stanley and Doucouliagos, 2012; Wang and Shailer, 2015).

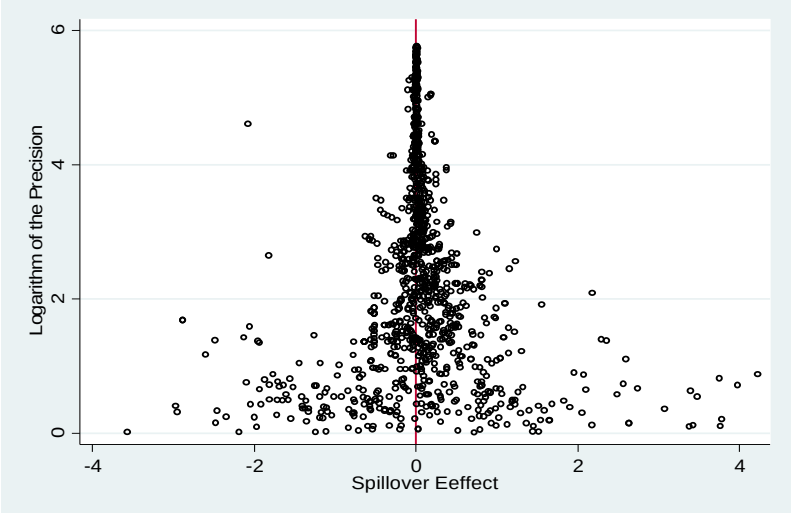
4.4 Findings and discussion

4.4.1 Funnel plots

Figure 4.3 shows the funnel plots of all studies - both published and unpublished. As discussed in Chapter 3 and Demena (2015), the plots suggest a positive bias. The top of the funnel plots is usually a good approximation of the true empirical effect after due allowance for publication bias (Stanley and Doucouliagos, 2010). Consequently, according to Roberts and Stanley (2005:27) '… for areas of research that contain many studies, the simplest remedy for publication bias is to average the findings from only the largest studies (say, the top 10 per cent)'.

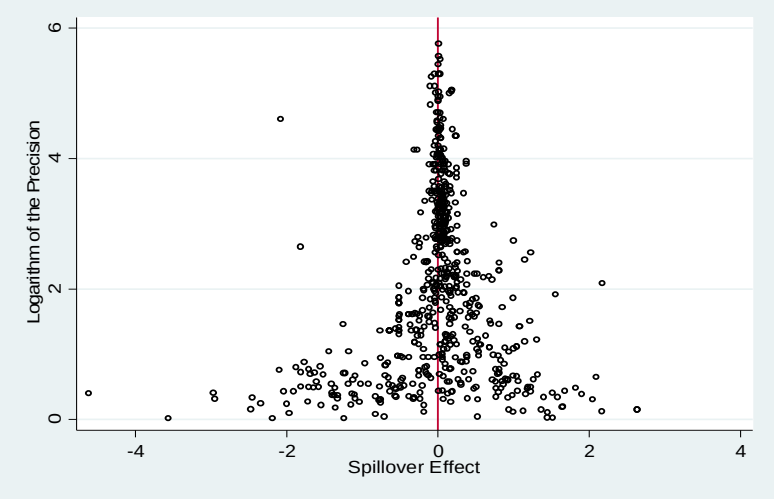
Averaging the top 10 per cent (123) estimates provides an average spillover effect of -0.010 (standard deviation 0.191). In the absence of unbiased reporting, spillover estimates would be expected to vary randomly around this average. However, the average of all 1,233 (i.e., excluding outliers) spillover estimates is 0.172: due to publication bias this average of all estimates appears to exceed the average of the most precise estimates by far and also the overall magnitude of the uncorrected weighted average (Section 4.3.3) is biased towards positive estimates. This kind of publication bias has clear policy implications. For instance, policy-makers may expect a 1.7 per cent increase in domestic firms' productivity from a 10-percentage-point increase in FDI. However, the top 10 per cent estimates suggest a 0.01 per cent decrease in the productivity of domestic firms.

Figure 4.3
Funnel plot for all-studies (N=1,233 from 65 studies)



Note: Instead of excluding extremely high precision values, we use the logarithm of the precision derived from the inverse of the standard error of the reported spillover estimates to allow better eye-o-metrics, i.e., visualization of the graphic images illustrating the relationship between the underlying treatment effects size and their measure of precisions.

Figure 4.4
Funnel plot for peer-reviewed studies (N=694 from 41 studies)



Note: See Figure 4.3.

While Figure 4.3 combines published and unpublished primary studies, Figure 4.4 uses peer-reviewed estimates for the sake of comparison. Except that the plots are heavier (Figure 4.3) and thinner (Figure 4.4), the shape and location are comparable. The next step is to move beyond eye-o-metrics to test econometrically for the existence and size of a genuine effect.

4.4.2 Genuine effects: PET

To assign greater weight to more precise estimates, we apply inverse variance weights and then use sample size as alternate weights. Table 4.2 reports the PET.

Table 4.2
Bivariate PET-MRA for genuine spillover effects

Panel 1: mixed-effects multilevel model (MEM)				
	All-studies		***Peer-reviewed studies***	
Variables	***(A1)***	***(B1)***	***(A2)***	***(B2)***
	t-value	***Effect size***	***t-value***	***Effect size***
Bias/FAT	1.054** (2.20)	0.419*** (3.42)	1.325* (1.76)	0.513* (1.84)
Genuine effect/PET	-0.006 (-1.16)	0.044 (0.60)	-0.011 (-1.11)	-0.018 (-0.19)
Observations	1,233	1,233	694	694
Studies	65	65	41	41
Panel 2: clustered data analysis (CDA)				
	All-studies		***Peer-reviewed studies***	
Variables	***(A3)***	***(B3)***	***(A4)***	***(B4)***
	t-value	***Effect size***	***t-value***	***Effect size***
Bias/FAT	0.505** (2.07)	0.454*** (3.27)	0.572* (1.77)	0.461 (1.47)
Genuine effect/PET	0.0004 (0.06)	-0.008 (-0.17)	-0.0005 (-0.02)	-0.039 (-0.44)
Observations	1,233	1,233	694	694
Studies	65	65	41	41

Note: ***, **, * stands for 1, 5 and 10 per cent level of significance. Figures in brackets are *t*-values. Test for between-study heterogeneity (Q-test) is 61705.15***on 1232 degrees of freedom with p-value less than 0.001 and I^2 statistics (variation in spillover estimates attributable to heterogeneity) is 98.0 per cent. The total number of observations is 1,233 instead of 1,237 since four estimates have zero standard errors. The number of all studies is 65 (41 peer-reviewed) as two peer-reviewed and two unpublished studies are identified as outliers. t-value columns estimated from equation (4.3) that uses inverse variance as weights and effect size columns from equation (4.2) using sample size weights. Panel 1 MEM estimated through the restricted maximum likelihood, Panel 2 CDA from study-level clustered standard errors.

To estimate a genuine spillover effect after due allowance for publication bias, the FAT in columns A1-A4 indicate the presence of bias.[8] Also, in columns B1-B4 that report results from sample size weights corrobo-

rate the corresponding columns A1-A4.[9] The PET in columns A1-A4 suggests the absence of any underlying genuine effect. Similar results suggested with sample size weight in columns B1-B4. In all the specifications, the PET (meta-average corrected for publication bias) is not statistically significant. After due allowance for publication bias, the meta-average of no effect cannot be rejected, with similar results regardless of either weights used. The inclusion of unpublished studies may result in inefficient parameter estimates as it increases the variance of the meta-dataset, especially if one assumes that peer-reviewed studies publish more reliable findings. Estimations A2 and A4 confirm and agree with the findings on the larger sample that includes the unpublished studies.[10]

In assessing the genuine spillover magnitude versus the uncorrected weighted average effect, the issue of publication bias is important. In all the A1-A4 specifications, the PET consistently suggests the absence of a genuine effect. So the overall uncorrected weighted spillover effect amounts to a publication (or other) bias. In this case, the size of the spillover effect reported in the primary studies is likely to be substantially larger than the actual effect.

Note, however, that these findings are an average across all methods. Therefore, we need a multivariate MRA as our inferences may also depend on other potential sources of heterogeneity such as the quality of the primary studies, misspecification, research design or other characteristics. Indeed, the heterogeneity across all the studies is evident by the Q-test reported under Table 4.2. The Q-test χ^2 distribution with $N\text{-}1$ degrees of freedom and 1,233 observations is 61,705 (p-value=0.000). The I^2 test of heterogeneity reports that the variation in the reported spillover effect size due to sampling error is 2 per cent. This motivates us to consider other potential sources of heterogeneity as reported in Section 4.3.4.

4.4.3 Sources of heterogeneity

Table 4.3 presents the results of the reduced multivariate MRA using GETS modelling. During this procedure, we observed that more than half of the moderator variables included in the general MRA are not statistically significant. We also note that all moderator variables are not equally important in explaining/contributing to the potential source of heterogeneity. In doing so, we eliminate 15 moderator variables that do not appear to be important for the explanation of the heterogeneity.[11]

Table 4.3
Multivariate MRA for source of heterogeneity: reduced model

Moderator Variables	*(A5) Specific*	*(A6) MEM*	*(A7) Robust se*	*(A8) CDA*	*(A9) MEM*	*(A10) CDA*	*(A11) Specific*
Genuine effect	0.127***	0.125***	0.127*	0.127***	0.138***	0.142***	0.129***
(Precision, β_0)	(0.023)	(0.024)	(0.067)	(0.025)	(0.024)	(0.039)	(0.026)
Bias coefficient	0.407*	0.456*	0.407***	0.407*	0.588**	0.505**	0.419*
(Intercept, β_1)	(0.215)	(0.248)	(0.109)	(0.226)	(0.255)	(0.206)	(0.215)
			Data				
Time span	-0.003***	-0.003***	-0.003***	-0.003***	-0.003***	-0.003***	-0.003***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
No. of firms [a]	0.004**	0.003	0.004	0.004	0.004**	0.003	0.003*
	(0.002)	(0.002)	(0.003)	(0.003)	(0.002)	(0.003)	(0.001)
			Estimation				
One-step	-0.019**	-0.018**	-0.019	-0.019*	-0.021**	-0.021*	-0.014*
Estimations	(0.008)	(0.008)	(0.016)	(0.010)	(0.008)	(0.012)	(0.008)
Fixed-effects esti-	-0.028***	-0.028***	-0.028	-0.028*	-0.025***	-0.025*	-0.029***
mators	(0.008)	(0.008)	(0.023)	(0.015)	(0.008)	(0.014)	(0.008)
Difference	-0.027**	-0.026**	-0.027	-0.027**	-0.022**	-0.022*	-0.028**
	(0.011)	(0.011)	(0.019)	(0.012)	(0.011)	(0.011)	(0.011)
Sector fixed-ef-	-0.024***	-0.023***	-0.024	-0.024***	-0.024***	-0.026***	-0.025***
fects	(0.008)	(0.008)	(0.021)	(0.006)	(0.008)	(0.010)	(0.009)
			Specification				
Technological gap	-0.054***	-0.053***	-0.054	-0.054***	-0.059***	-0.059***	-0.057***
	(0.014)	(0.014)	(0.045)	(0.016)	(0.014)	(0.017)	(0.014)
Lagged spillover	-0.167***	-0.164***	-0.167***	-0.167***	-0.165***	-0.168***	-0.168***
	(0.018)	(0.018)	(0.064)	(0.020)	(0.018)	(0.020)	(0.019)
					0.035***	0.034	
Interaction terms	-	-	-	-	(0.009)	(0.023)	-
			Publication				
Published	0.035**	0.035**	0.035*	0.035	0.035**	0.035	0.037**
	(0.016)	(0.017)	(0.020)	(0.022)	(0.017)	(0.023)	(0.017)
Publication date	-0.003***	-0.003***	-0.003*	-0.003***	-0.004***	-0.004***	-0.003***
	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)
Journal rank	-0.035**	-0.035**	-0.035*	-0.035*	-0.053***	-0.051***	-0.039**
	(0.016)	(0.016)	(0.021)	(0.019)	(0.017)	(0.020)	(0.016)
			Geographical Location				
Latin America	-	-	-	-	-	-	0.003
							(0.014)
Africa	-	-	-	-	-	-	-0.011
							(0.017)
Observations	1,233	1,233	1,233	1,233	1,233	1,233	1,233
Studies	65	65	65	65	65	65	65

Notes: The dependent variable is the t-value of the spillover estimates. Figures in parenthesis are standard errors (SE). Column A5 reports the specific model without adjusting SE, columns A6 and A9 (mixed-effects multilevel model) using the restricted maximum likelihood, column A7 robust SE and columns A8 and A10 (clustered data analysis) study-level clustered SE. All columns use inverse variance weights. [a] Coefficients and standard errors are multiplied by a thousand to make the figures easier to read.

Considering the general versus the specific multivariate model, a trade-off exists between, on the one hand, potential multi-collinearity and loss of degrees of freedom, and on the other hand, the inclusion of all moderator variables (Mekasha and Trap, 2013). Thus, following the GETS procedure, 11 variables remain statistically significant at least at 10 per cent significance (A5). Indeed, the joint test of these 11 variables rejects the null hypothesis of a zero joint effect $F_{(11,\ 1220)} = 21.57$. To account for within-study correlation, this specific model is then re-estimated using the preferred MEM model[12] and, for comparison and robustness check, with robust standard errors and CDA.

The columns in Table 4.3 report:

- the specific model without adjusting standard errors (A5 and A11),
- MEM model through the restricted maximum likelihood (A6 and A9),
- robust standard errors (A7) and
- clustered standard errors (A8 and A10).

All columns use inverse variance weights.

Controlling for within-study dependence, columns A6 and A8 report 10 moderator variables that potentially explain the heterogeneity in the reported spillover estimates. We find that the spillover effects in the primary studies are systematically influenced. The reported spillover effect will *ceteris paribus* be larger when: spillovers estimated using a two-step process, technological gap and/or lagged spillovers are not included, and the primary study is peer-reviewed. The use of a longer data time span, more recent primary studies, publication in higher ranked journals, estimations performed in differences and the fixed-effect estimators are associated with smaller reported spillovers.

We compare and test the robustness of the results using estimates with robust standard errors (A7) and clustered standard errors (A8) reported in Table 4.3. Without due allowance for data dependence, A7 reports similar results as A6 (but the statistical significance reduces for eight variables).

Controlling for data dependence, A8 corroborates the findings of A6 (but the statistical significance reduces for one-step estimation, fixed-effect estimators, publication in a peer-reviewed journal and scientific journal rank).

4.4.3.1 Discussion and implications for research design

On average, the time span covered by the study affects the reported spillover estimates and significantly reduces their size by 0.003 per annum. This finding suggests the importance of panel data with wider time coverage (as compared to single-period cross-sections). This implies that the use of a longer data time span is an important moderator variable in research on the effect of FDI spillovers. From this perspective, the higher positive spillover estimates based on cross-sections reflect upward bias due to not controlling for unobserved time-invariant firm-specific effects. Also, the larger effect from cross-section studies decreases/disappears with time.

Regarding estimation techniques, a one-step estimation of spillovers using output, labour productivity, or value-added on average reports a 0.018 lower spillover effect than the two-step estimation. In light of this, given the bias towards more/higher positive spillover in the reported estimates, we prefer the use of the one-step approach. For random-effects, GMM or other spillover estimators, effects on average increase by 0.028, reporting more positive spillover estimates compared to the fixed-effects regression.

Regarding the specification characteristics, the inclusion of the technological levels of domestic firms and estimates of lagged spillovers appear to affect the estimates. A specification that controls for the existing technological difference between domestic and foreign firms finds lower spillover effects (on average 0.053). This supports Findlay (1978), Wang and Blomström (1992), Castellani and Zanfei (2003) and Jordaan (2008a) when they argue that spillovers do not occur automatically but depend on technological heterogeneity.

The conceptual debate (see Cohen and Levinthal, 1989; Findlay, 1978; Lapan and Bardhan, 1973; Wang and Blomström, 1992) and the contrasting empirical evidence (see Castellani and Zanfei, 2003; Kathuria, 2001; Kathuria, 2010; Kokko, 1994) over how the domestic firms' technological level influences the outcome of a given spillover estimate indicates a significant opportunity for future research. It would, for example, be important to investigate how the size of the technological gap between

domestic and foreign firms influences potential spillovers. The majority of the primary studies either associate high (low) absorptive capacity with low (high) technological difference or exclude these important moderator variables from the specification. We find that the technological gap is statistically significant but that the absorptive capacity is insignificant, pointing out the importance of disentangling the absorptive capacity hypothesis from the technological gap hypothesis. Indeed, both equating the absorptive capacity as the inverse of the technological gap and excluding them from the analysis, is potentially flawed.

Lastly, on publication status, peer-reviewed studies report spillover estimates that are larger (on average higher by 0.035) than unpublished studies. We also find that the publication year of the study affects reported estimates, in that recent studies tend to report lower spillover estimates (on average 0.003 lower). Furthermore, a high-ranked journal is likely to report lower spillover estimates.

For the sake of geographical (continental) difference, we further conduct MRA of equation (4.3) in order to check whether geographical location is the reason behind the heterogeneity. We include dummy variables to account for potential regional difference among the three geographical locations included in the dataset. That is, we include dummies if the estimate reported using data from Latin American countries (1 for estimates coming from Latin America and 0 otherwise), African countries (0 for estimates coming from non-African countries and 1 otherwise), and use estimates of data from Asian countries as the base. Results are reported in A11 of Table 4.3. Both coefficients of the dummies used to control geographical difference suggest statistically insignificant results. Studies from Latin America on average report more positive (larger positive) effect size as compared to data from Asia, whereas from Africa effect size is lower positive (larger negative) but statistically insignificant. These may suggest that, on average, the statistical insignificance of continental difference cannot be rejected, implying that the nature of heterogeneity reported in the primary studies may not be explained by geographical location. Furthermore, A11 corroborates the corresponding results of A5, except now the statistical significance of two variables has reduced from 5 per cent to 10 per cent significance level. This might also be an indication that the initial omission of geographical dummies is not causing an omitted variable bias as the reported effects in A5 and A11 remain unaltered.

4.4.3.2 Further robustness checks: bivariate and multivariate

A further robustness check relates to interaction variables. When econometric specifications use interaction terms, sample mean and covariance of the interacted variable are required in order to calculate an effect size.[13] However, in the primary empirical studies the mean and covariance of the interaction term is not always available. Rather than omitting these estimates of the primary studies, Havránek and Iršová (2011) evaluate the interaction effect of foreign presence at sample means of the interacted variables. We follow a different approach and add a binary variable in the meta-dataset (1 for estimates coming from interaction term and 0 otherwise).

Table 4.4
Bivariate PET-MRA for genuine spillover effects: regressions excluding observations from the interaction variables

Panel 1: mixed-effects multilevel model (MEM)				
Variables	***All-studies***		***Peer-reviewed studies***	
	(A12) ***t-value***	***(B5)*** ***Effect size***	***(A13)*** ***t-value***	***(B6)*** ***Effect size***
Bias/FAT	1.232** (2.22)	0.396*** (2.98)	2.151**(2.22)	0.508* (1.88)
Genuine effect/PET	-0.014** (-2.09)	0.059 (0.59)	-0.051* (-3.15)	-0.074 (-0.67)
Observations	1,034	1,034	591	591
Studies	64	64	40	40
Panel 2: clustered data analysis (CDA)				
Variables	***All-studies***		***Peer-reviewed studies***	
	(A14) ***t-value***	***(B7)*** ***Effect size***	***(A15)*** ***t-value***	***(B8)*** ***Effect size***
Bias/FAT	0.505 (1.64)	0.446** (2.55)	0.547 (1.08)	0.378 (1.00)
Genuine effect/PET	-0.002 (-0.21)	0.003 (0.06)	-0.007 (-0.13)	-0.039 (-0.43)
Observations	1,034	1,034	591	591
Studies	64	64	40	40

Notes: See Table 4.2.

Estimates for PET-MRA *excluding* the interaction terms are reported in Table 4.4. Both the MEM and CDA corroborate our main findings of the corresponding PET in Table 4.2 despite the reduction in the number of observations and primary studies.[14] Furthermore, we deal with interaction estimates in the MRA (Table 4.3) by including a dummy variable for the interacted terms. A9 and A10, respectively, mimic the findings of A6 and A8, except that the number of firms from A9 is now statistically significant. We also found that the effect of including interaction terms in the

primary studies from the preferred model on average is associated with higher spillovers effect.

4.4.4 Genuine spillover effect from the multivariate MRA: 'best practice' effect

In comparison to the PET (Section 4.4.2), the inclusion of moderator variables strongly impacts on the size and significance of the genuine spillover effect. This underlines the need for meta-analysts to consider potential moderator variables. However, there are many potential genuine heterogeneity effects than can be related to a single PET. We therefore follow up in order to systematically estimate the underlying genuine effect from the multivariate MRA conditional on the identified sources of heterogeneity that alleviate omitted variable bias, endogeneity problems and controls for publication bias. This analysis is labelled the 'best practice' method (Havránek and Iršová, 2011; Stanley and Doucouliagos, 2012; Wang and Shailer, 2015).

First, we set all possible sources of heterogeneity equal to zero in A6 and A8. This yields a statistically significant positive spillover effect of 0.125 (t=5.23) and 0.127 (t=5.11), respectively.[15] Next, we apply the characteristics of the study by Aitken and Harrison (1999) in order to arrive at the 'best practice' estimate. We selected this study for three reasons. First, it is published in the *AER*, one of the leading economics journals with a very stringent referee procedure. Second, it is the most cited study in our dataset (3,051 citations as of August 2013). Third, they use firm-level panel data, perform a one-step regression in differences, and their specification controls for productivity differences across industries. For these reasons this study seems to be free from model misspecification. Using Aitken and Harrison's (1999) study characteristics, the predicted effect size is 0.086 and statistically significant at the 99 per cent confidence level. The procedure yields similar result when A8 is used: 0.085 with t=3.41. After correcting for publication bias and misspecification, the magnitude of the underlying genuine effect is about 0.09.

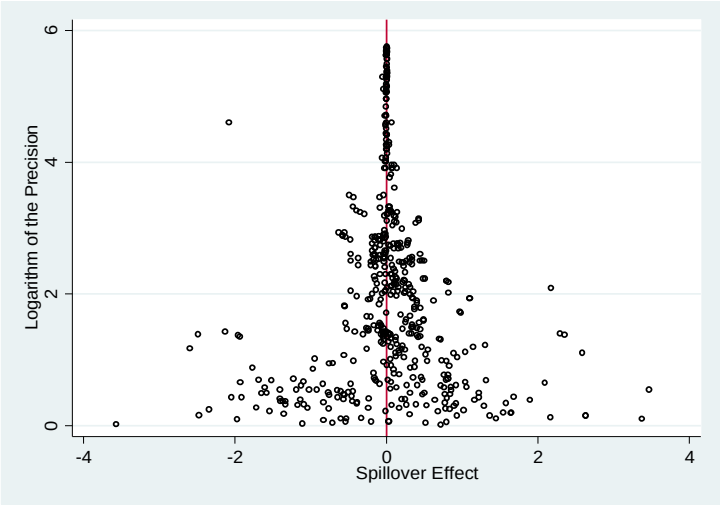
Conversely, as Havránek and Iršová (2011:240) put it, the 'worst practice' is '… [a] mirror image of the best practice estimate'. Studies that use industry-level aggregated cross-sectional data, endogenous TFP estimation, OLS, and specifications that do not control for productivity difference across industries among others, would fall into this category. This

results in a significantly higher positive effect size of 0.155 (similarly 0.159 for A8), suggesting again that estimates reported in those studies are biased due to misspecification.

4.4.5 Further investigation for publication bias

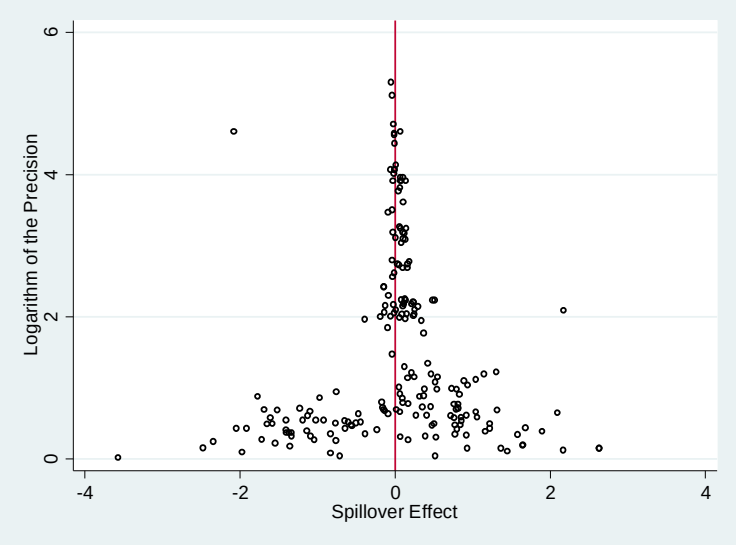
The inclusion of potential sources of heterogeneity does not remove the publication bias identified in Chapter 3. An important issue is whether publication bias could be the result of 'best practice' choices regarding research design and methods. Therefore, we ask ourselves the question: could it be that studies that comply with 'best practice' characteristics have a (stronger) publication bias. We use panel data, firm-level analysis, and control for sector fixed-effects (recall our earlier 'best practice' research design estimates).[16] Funnel plots using observations from such 'best practice' are reported in Figure 4.5 and Figure 4.6 for all studies and peer-reviewed studies only, respectively. Figures 4.5 and 4.6 mimic the plots of the corresponding Figures 4.3 and 4.4. Leaving aside that the plots are now thinner due to the substantial reduction in the number of observations, the shape and location are comparable, and therefore 'best practice' choices do not appear to be associated with publication bias.

Figure 4.5
Best practice funnel: all-studies (N=593 from 29 studies)



Note: See Figure 4.3.

Figure 4.6
Best practice funnel: peer-reviewed studies (N=234 from 15 studies)



Note: See Figure 4.3.

Following Havránek and Iršová (2011), we also provide a more formal test by interacting the variables that define 'best practice' with the estimated spillover effect's standard error.[17] Adding these interaction variables to our MRA specification, regression (4.3), we find that none of the aspects of the 'best practice' are statistically significant.[18] Once more, corroborating the evidence presented in Chapter 3, the further investigation for publication bias concludes that the reported spillover effects from FDI are biased towards positive and statistically significant results. However, the 'best practice' approach does not appear to be causing publication bias.

4.5 Conclusions

Our main aim is to analyze the intra-sector FDI productivity spillover effects using 1,450 reported estimates from 69 primary studies by 93 researchers covering 31 developing countries published up to an including 2013.

An important implication of this article is that the (systematic) selection of primary studies may lead to bias in a meta-analysis. Meta-analyses often involve judgements in identifying the primary studies. Thanks to our meta-

analysis, we know that the selection of studies in previous meta-analyses has had an impact on the findings and led to misleading conclusions (for example, the issue of publication bias and the genuine empirical effect described in Chapters 3 and 4, respectively). In this thesis, we try to avoid this bias by gathering all studies for developing countries. We strictly follow the MRA reporting guidelines of MAER-Net.

We found a positive and significant uncorrected weighted average spillover effect of 0.16. We investigated whether this effect is genuine or affected by publication (or other) bias using funnel plots, PET, and GETS meta-analytical approaches. As illustrated in Chapter 3, consistent with the pioneering evidence presented by Görg and Strobl (2001) and in contrast to the two most recent studies by Iršová and Havránek (2013) and Mebratie and van Bergeijk (2013), our study clearly uncovers that publication bias is a problem in this field (we also establish the extent and source of the bias) that makes it difficult to identify and disguises the underlying size of the genuine effect of FDI on productivity spillovers. Reported spillover estimates significantly overstate the true effect, but this does not appear to have been caused by either publication selection pressure from journal editors and reviewers or by authors' prior interest to follow 'best practice'. Unlike Iršová and Havránek (2013), who find that intra-sector spillovers are statistically indistinguishable from zero, we find that the underlying genuine spillover effect is economically important to a magnitude of 0.09, notably after taking publication bias and misspecification of the primary studies into account. This becomes clear in the multivariate approach, showing the need to carefully consider moderator variables which can potentially help to explain the nature of the heterogeneity in reported findings.

Primary empirical studies appear to be subjective in the choice of methodology. Application of MRA that investigates the diverse empirical findings of primary studies can help by giving useful insights into the theory and stimulate 'best practice' to improve the research design of future primary studies. The 'best practice' in the MRA methodology focuses on controlling publication bias, reducing omitted variable bias and endogeneity issues across the studies under review. Our results for 'best practice' support theories that predict a positive effect of spillovers from FDI.

Despite the robust positive underlying spillover effect, there is also substantial heterogeneity in the reported spillover estimates. The sign and size of the spillover effects depends systematically on two major sources of

heterogeneity: specification choices and publication bias (but are also affected by data and estimation characteristics). Hence, we suggest that future research needs to carefully consider the selection of explanatory variables in order to avoid omitted variable bias. Indeed, understanding publication bias potentially calls for researchers to consider the sources of bias towards positive spillover estimates.

With respect to the technological hypothesis versus the absorptive capacity hypothesis, it is important to disentangle these two hypotheses as each may lead to different spillover estimates. Furthermore, not only from the academic point of view, but also from a policy perspective, it would be very important to separate the different transmission mechanisms under which spillovers actually take place. Our review of the empirical findings of 74 studies shows a predominant of failure to identify the mechanisms underlying spillovers effect. Thus, future studies should consider not only whether spillovers occur, but also look inside the black box of how spillovers actually emerge. Importantly, empirical research efforts should also expand to cover more developing countries. Accordingly, the next chapter explores this and other related inferences drawn from the studies reviewed by us.

Notes

[1] The chapter is also available as a conference proceeding from the 1st IGAD Economic Conference, 2014; the 8th annual MAER-Net Colloquium; and the Development Economics and Policy 2014 Annual International Conference of the German Economic Association, Research Group on Development Economics.

[2] Recall that Mebratie and van Bergeijk (2013) also report the absence of publication bias (using a dummy variable for peer-reviewed studies) but not the underlying genuine spillover effect (as do the other three meta-analyses: Görg and Strobl, 2001; Meyer and Sinani, 2009; Wooster and Diebel, 2010).

[3] The best-set consists of one estimate that the author believes to be the key regression of the study often labelled 'preferred equation', whereas the all-set is collected from all relevant estimates that may offer more observations to explain heterogeneity. The average-set is computed from the all-set estimates.

[4] Mekasha and Trap (2013) re-investigated the aid-growth link based on the 68 primary studies initially meta-analyzed by Doucouliagos and Paldam (2008). In computing the magnitude of the uncorrected weighted average effect, the latter used sample size weights, whereas the former used the inverse of the variance and both resulted in similar results. This illustrates that the use of either weight may not

matter. However, Stanley and Doucouliagos (2012) report that uncorrected weighted averages using the fixed-effects and random-effects are biased in the face of publication bias.

[5] That is: $t_{ij} = \beta_1 + \beta_0(1/Se_{ij}) + \mu_{ij} + \varepsilon_{ij}$ where μ_{ij} is study-level random-effects and ε_{ij} is measurement error disturbance term.

[6] In the first-step, authors estimate TFP, followed by a second-step estimation of spillovers effect using TFP as the dependent variable.

[7] The Research School for International Development (CERES) provides journal quality classification based on the ISI Web of Knowledge impact factor http://ceres.fss.uu.nl/rating-lists/rating-list/. A-journals (high quality) ranked form the top one-third cited outlets of the 2013 ISI impact factor. Thus, we create a dummy for high quality journals and use other classifications as reference.

[8] As illustrated in Chapter 3 and Demena (2015) specifically, when all observations are included in the specification, the preferred MEM (A1) shows positive and significant publication bias. Also when only observations from published studies in peer-reviewed journals (A2) are considered, we detect positive and significant publication bias. To further check robustness, we use CDA (A3 and A4) that again provides evidence of publication bias. Corroborating the funnel diagrams, the objective MRA provides clear evidence of publication bias.

[9] The FAT in A1 versus A2 (similarly A3 versus A4, B1 versus B2, and B3 versus B4) can also be used to test whether journal reviewers and editors are a source of publication bias in selecting and accepting findings. In both Panel 1 and Panel 2, the magnitude of the publication bias (FAT) is higher for studies published in a peer-reviewed journal compared to all studies, but this difference is not statistically significant. Thus corroborating the analysis in Chapter 3, the primary empirical studies are unlikely to have been affected by an extra bias by journal editors and reviewers.

[10] Note that this leads to a significant reduction in the number of observations of the meta-dataset as well as a loss of additional information available through the full dataset. Furthermore, the funnel plots may suggest the presence of some influential observations (i.e., high precision or high values that appear to be separate from the main body of the reported estimates). We have attempted to consider the issue of high precision values from the funnel diagrams. In this case, we have checked the result by trimmed high precision values (say more than 5 logarithm of precision) and this exclusion yields similar result. However, first note that there is no clear argument to define the cut-off to separate high precision values (although we have further checked the robustness of the results by excluding high precision values from the analysis). Second, high precision values must be retained (unless when they are in error) as they are genuinely informative about the research literature considered (Stanley and Doucouliagos, 2012).

[11] Insignificant moderator variables excluded from the reduced model are (ordered from least significance): all firms, exports, panel data, study citations, TFP estimated with OP or LP, data source, foreign presence in equity, firm size, absorptive capacity, linear/log-log, foreign presence in employment, balanced data, year fixed-effects, OLS and firm level data. In support of the removal of these variables, the null hypothesis of a zero joint effect cannot be rejected, ($F_{15,\ 1205}$) = 0.49 (p-value 0.9483): jointly the 15 variables appear to be statistically indistinguishable from zero, and thus do not contribute to the explanation of the heterogeneity.

[12] We estimated the mixed-effects multilevel model, and thus account for both within-study and across-study variations. Robust methods in meta-analysis using the MEM model are widely employed, (see Doucouliagos and Laroche, 2009; Doucouliagos and Stanley, 2009; Havránek, 2010; Havránek and Iršová, 2011). In the case of the FDI-spillovers, the result from the MEM is very similar to the CDA findings. In our view, it remains an issue for future research whether the CDA version or the MEM better reflects the meta-analysis of the literature in question.

[13] When the regression specification includes interaction of the spillover variables and other control variables (typically, technological gap and/or absorptive capacity) as in the following equation:

$$\log Y_i = a + bX_i + cX_i * Z_i + dZ_i + \cdots + \varepsilon_i$$

the effect size *(e)* and the standard error *(Se)*:

$$e = 100(b + c\bar{X})$$

$$S_e = 100\sqrt{var(b) + 4\,\overline{X_\iota * Z_\iota}\,var\,(c) + 4\bar{X}_\iota cov(b,c)}$$

[14] We thank an anonymous referee of the *Journal of Economic Surveys* for this valuable observation.

[15] Note that we started from the condition that all possible sources of heterogeneity are set at zero (i.e., the precision of reported spillover estimates) in order to avoid a subjective judgment. In other words, we use unpublished papers that use cross-sectional data aggregated at industry-level among others. This predicted the underlying genuine effect to positive and statistically significant with a magnitude of 0.125 (A6) and 0.127 (A8). Also, note that this effect is about 22 per cent less than the reported weighted average effect.

[16] We cannot apply all elements of the 'best practice' because too few estimates would remain for analysis (Havránek and Iršová, 2011, chose a similar approach).

[17] We have interacted with and tested the time span of the data, publication status, specifications for sector fixed-effect, one-step estimations in differences and specifications that control technological level.

[18] Indeed, the joint test of these interaction variables reveals that the null hypothesis of a zero effect cannot be rejected (*p-value* of 0.5643).

5 FDI, spillovers and firm-level heterogeneity: Identifying transmission channels[1]

Abstract

The empirical literature on the spillover effects of FDI has so far not analyzed the transmission channels through which FDI impacts on the productivity of domestic firms. We analyze a panel of eight countries in SSA for the years 2006 and 2014 and demonstrate the empirical relevance of distinguishing three channels - demonstration, labour mobility and competition - by providing a fuller and a more nuanced picture the effects. We provide measures of these effects and also show that the size, significance and sign of spillover effects at these lower levels of aggregation depend on the local absorptive capacity, technology levels, geographical proximity and foreign ownership structure. Results are robust to the construction of spillover and outcome variables, the introduction of additional explanatory variables and an alternative estimation method.

5.1 Introduction

The objective of this chapter is to analyse the productivity spillover effects of FDI by explicitly separating the various transmission channels through which they may occur, as well as taking into account firm heterogeneity. We do this for a number of sub-Saharan economies, utilizing a unique firm-level dataset. Our analysis permits a considerably more nuanced approach to evaluating the potential productivity spillovers of FDI, as we are able to disentangle which spillover transmission effects work, and under which particular circumstances. To the best of our knowledge, our analysis is the first empirical analysis that examines the different channels through which FDI productivity spillovers can occur in the developing country

context, and which also takes into account the differing ability of local firms to benefit from productivity spillovers.

FDI is not only regarded as the *sine qua non* for growth strategies in developing countries, but there is also broad agreement that FDI improves the productivity of domestic firms. When foreign firms invest in a host country, they often bring with them their proprietary technology (Dunning, 1981; Mebratie and Bedi, 2013, Murshed, 2010). Based on the assumption that local firms will be able to benefit from this knowledge transfer, many governments have introduced policies that encourage FDI by offering extensive financial incentives (Aitken and Harrison, 1999; Merlevede et al., 2014).

The literature distinguishes between two groups of FDI spillover effects: knowledge spillovers and allocative efficiency spillovers. Knowledge spillovers occur via skilled *labour mobility* and by *demonstrating* the feasibility or enabling the *imitation* of new technologies. Allocative efficiency spillovers arise from the *competitive* pressures to improve local efficiency by using existing technology and resources more efficiently or by bringing in new technology. These two groups of spillover effects describe the three theoretically posited transmission channels of intra-industry productivity spillovers: worker mobility, imitation and competition effects. Unfortunately, there is a gap between the theoretical propositions and their empirical application.

Evidence of the actual productivity spillovers as a result of FDI is mixed. We systematically reviewed 74 empirical studies providing 1,545 estimated spillovers conducted by 96 researchers for 31 developing countries published in 1983-2013. Research on FDI spillovers leads to inconsistent results that continue to be disputed in the literature. The results of our research suggest that only about one-third of the studies we looked at find significantly positive productivity gains, whereas one in six find significantly negative effects. Approximately, 51 per cent report insignificant spillover effects. So despite the policy relevance of promoting FDI and the burgeoning of this literature, the empirical evidence provides diverging results.

Moreover, the available 74 empirical studies merely investigate spillover effects in terms of whether the productivity of local firms is affected by FDI. Spillover effects are commonly investigated in a framework of production function. The productivity of domestic firms is regressed along various explanatory variables that introduce one spillover variable in terms

of foreign share in a given industry. More specifically, the studies we reviewed commonly use three measures of FDI presence. Approximately 18 per cent use the foreign share in equity, 35 per cent the foreign share in employment and 47 per cent the foreign share in sales. Typically, only one of the three variables is used in a primary study to interpret the effect of FDI presence.

Indeed, existing studies have not investigated the channels through which the productivity spillovers are expected to emerge. This is because the three measures of FDI presence mentioned above mainly capture the effects of demonstration or contagion-spillover (Kokko, 1996; Hamida, 2013). They cannot explain spillovers that are determined by worker mobility (Hamida, 2013) and competition effects (Kokko, 1996). In fact, the theoretical model by Wang and Blomström (1992) indicates that spillovers from competition are not necessarily determined by the share of FDI presence alone, but rather by the interaction between domestic and foreign firms. Tian (2007) also suggests that the share of foreign presence offers only a partial picture of spillover effects. Therefore, the implicit assumption that the FDI share alone provides the overall spillover effect can be misleading as it disregards certain spillover channels. Furthermore, an analysis of the foreign share alone may result in biased estimates, as the error term will consist partly of the non-included spillover channels.

Set against this background, the present chapter hypothesizes that the share of FDI presence alone cannot represent the complete picture of intra-industry productivity spillover effects.[2] Our approach allows the FDI spillover effects to vary according to the various transmission channels mentioned above, hence bridging the gap between theoretical perspectives and their empirical implementation. We also take into account the nature of firm-level heterogeneity as local firms will differ in their ability to benefit from productivity spillovers from foreign firms. The empirical literature largely ignores the heterogeneity in both the absorptive capacity and the technological levels of domestic firms (only 10 per cent of the studies we reviewed control for these factors). We are interested in using SSA, as these countries are under-represented in the empirical investigation of the 74 empirical studies considered in Chapters 3 and 4.

The rest of the chapter continues as follows: Section 5.2 summarizes the theoretical perspectives on transmission channels and firm-level het-

erogeneity, setting out the hypotheses to be examined. Section 5.3 discusses the data and the empirical approach used. Section 5.4 gives the detailed results and Section 5.5 concludes.

5.2 The framework: theoretical perspectives and hypotheses formulation

This section first discusses the theoretical perspective of the spillover channels in order to set out a framework for the analysis. Next, it highlights firm-level heterogeneity in relation to firms' absorptive capacity and technological level. Finally, it highlights the importance of geographical proximity and ownership structure. In each sub-section, we set out testable hypotheses.

5.2.1 FDI spillovers and transmission channels

FDI-induced intra-industry spillover effects are understood to occur via three channels: imitation, worker mobility and competition effects. The theoretical channels distinguish the nature of spillover effects into technological and pecuniary spillovers. The former operates through the direct effect on the production process caused by the flow of knowledge from one firm to another firm that is not captured by the market mechanism (Papandreou, 1994). In contrast, the latter spillovers may result from an indirect effect driven by the market mechanism (Scitovsky, 1954).

First, the imitation/demonstration channel is probably the most typical technological spillover assumed to occur via the non-market mechanism (Blomström and Kokko, 1998). The imitation of new products and processes provided by FDI to the host market is assumed to speed up access to and utilization of technologies by domestic firms. The argument hypothesizes that exposure to the superior technology introduced by foreign affiliates can lead to productivity or efficiency gains for local firms by enhancing their production methods.

Secondly, the worker mobility channel works through pecuniary or technological spillovers. On the one hand, technological spillovers occur when a domestic firm hires workers who have previously worked for or who were trained by foreign affiliates, allowing a domestic firm to benefit from the experience and knowledge acquired in the foreign firms (Saggi, 2002). Technological spillovers also emerge when locals previously working for foreign subsidiaries setup their own business. On the other hand,

foreign firms may attract skilled local workers by paying higher wages than domestic firms. The wage differentials between foreign and domestic firms can generate pecuniary spillovers in two ways. First, the additional experience and knowledge acquired by local workers while working for foreign affiliates might be available to the domestic firms at a price equivalent to this wage premium. Second, the presence of a higher wage may put upward pressure on the overall industry wage rate, resulting in a negative effect on the profits of the domestic firms. This market mechanism may then compel domestic firms to be more efficient, thereby generating positive pecuniary spillovers.

Thirdly, the competition channel is postulated to emerge via the market mechanism, yielding pecuniary spillovers. Competition in the local market can be interpreted as an incentive for domestic firms to use existing technology and resources more efficiently or even adopt new technology, generating positive pecuniary spillovers. In contrast, negative pecuniary spillovers may result from the existence of a market loss effect. Foreign firms may lower the market share of domestic firms by taking part of the local market. Moreover, if domestic firms are unable to compete, foreign firms may push them out of the local market altogether; a crowding out effect.

Over the last four decades, a wide range of literature has developed the theoretical concept of spillover effects. Too often, existing theoretical models have not offered a complete picture of the channels outlined above. In the theoretical models developed by Koizumi and Kopecky (1977), Findlay (1978) and Das (1987), spillovers are determined by the foreign share alone - the imitation-determined or contagion-spillover types. In Wang and Blomström (1992), spillovers are assumed to emerge endogenously resulting from the technological competition between foreign and local firms - the competition-determined spillovers. In the Kaufmann (1997), Fosfuri et al. (2001), and Glass and Saggi (2002) studies, spillovers are expected to occur through the movement of workers from foreign affiliates - worker mobility-determined spillovers. We argue that the three types of spillovers should be combined to form a single estimation to gauge the overall spillover effects. Hence, our main hypothesis is as follows:

Hypothesis 1: *The occurrence, sign and size of spillover effects depend on the channels through which they emerge.*

5.2.2 Spillover channels and firm-level heterogeneity

Although spillover effects from FDI require a disentangling of the transmission mechanisms by which they occur, firms also differ in terms of technological competence and absorptive capacity (Hamida, 2013). Spillovers may therefore not emerge evenly across firms, or be equally valuable to all firms (Merlevede et al., 2014). However, most studies have attempted to test spillover effects regardless of the nature of firm-level heterogeneity (Chapter 4 of this thesis; Demena and van Bergeijk, 2017a). The empirical design of existing studies recognizes the importance of factor input and its quality, but fails to include some important firm-level heterogeneity characteristics. For instance, about 90 per cent of the specifications do not consider the technological level and absorptive capacity of the domestic firms, a point already stressed by Mebratie and van Bergeijk (2013) regarding absorptive capacity.

5.2.2.1 Spillover channels and technological level

With regard to technological levels, there are two opposing arguments based on economic theory. One group hypothesizes that a large technology gap, when the host country has a low technology level, increases the likelihood of spillover gains. The original model of technology spillovers by Findlay (1978), and another by Wang and Blomström (1992), put forward the catch-up hypothesis: they sketch a positive relationship between the size of the technological gap and the likelihood of spillovers. The original speculative thinkers of this viewpoint were first Veblen (1915) followed by Gerschenkron (1962). Their ideas are jointly referred to as the Veblen-Gerschenkron (VG) effect which was revisited by Abramovitz (1986). Specifically, this theoretical assumption supports the idea that faster technological transfer takes place in a context of relatively greater technological disparity. Another group theorizes that smaller technology gaps may lead to potential spillover benefits (Lapan and Bardhan, 1973; Cohen and Levinthal, 1989). This group maintains the technology accumulation hypothesis, that is, a similar technological level between local and foreign technology results in larger spillover effects. Hence, a certain technological level seems to be important for spillover benefits.

According to Mody (1989), firms that are characterized by a relatively high technology level or by a small technological gap with the foreign firm, have a greater capacity to gain benefits from FDI via the imitation and/or competition channels. Firms in the low technology group may be unable

to gain benefits via these channels as such firms lack a sufficiently qualified labour force to enable them to exploit available foreign technologies. Firms in the low technology group may rather benefit from spillovers through the worker mobility channel, as this channel can provide technical assistance that allows them to better understand and use available foreign technology (Hamida, 2013). Accordingly, our next hypothesis is:

Hypothesis 2: *Technological gaps are relevant in SSA for the spillover channels and benefit largely domestic firms with a smaller technological difference vis-à-vis foreign counterparts.*

5.2.2.2 Spillover channels and absorptive capacity

As to absorptive capacity, spillovers are hypothesized to depend on the existing capacity of domestic firms to efficiently exploit external sources of knowledge (Narula and Marin, 2003). The concept of absorptive capacity includes the ability of a firm to internalize the value of new external information, modify it to fit into their own application, and process it productively (Cohen and Levinthal, 1990). As such, absorptive capacity is not purely about imitation. This is because firms cannot reap the benefit of external knowledge unless they invest in their own absorptive capacity, as the knowledge they are gaining may be specific to the original firm (Narula and Marin, 2003). Consequently, the ability to assimilate and use external sources of information is highly related to the level of firm's prior knowledge. The occurrence and extent of potential spillover effects in turn may depend on these firms' ability to internalize, modify and process productively: known as absorptive capacity.

Accordingly, firms with a high absorptive capacity may benefit more from spillovers via imitation and/or competition channels, as such firms invest in the quality of their labour force. This would allow them to obtain specific foreign techniques through both the implementation of foreign technologies and the development of existing ones (Hamida, 2013). Conversely, firms with a low absorptive capacity may only benefit through imitation effects, as these firms may not possess the required skilled labour force that would help them to cope and compete with foreign rivals. Hence, our third hypothesis is:

Hypothesis 3: *The workings and size of the spillover channels is different according to the levels of absorptive capacity in SSA firms.*

5.2.3 Spillover channels and geographic proximity

The workings of the spillover channels are also linked to geographical proximity (Girma, 2005; Jordaan, 2005; Hamida, 2013). Specifically, Girma (2005) summarizes three main reasons for a geographical dimension to the channels. First, at least initially, imitation effects benefit physically close domestic firms or ones that operate in the same region as foreign firms. Imitation of the production of a new product or the efficient production of an existing product is more likely to take place when both firms are located in close proximity (Jordaan, 2005). Second, labour mobility is likely to be confined to the same locality. Third, the theory of economic geography indicates that the potential for spillovers is more pronounced when both firms are in geographic proximity. Jordaan (2005) adds that the imitation and worker mobility channels are likely to generate positive spillovers when the two types of firms are geographically co-located, whereas the competition channel is ambiguous as proximity enhances the occurrence of both negative and positive pecuniary spillovers. In general, the consensus is that spillovers through geographical proximity are likely to operate due to the imitation effect and labour pooling, as these channels are more possible when local firms are located close to foreign counterparts. In contrast, the workings of the competition channel do not seem to be substantially enhanced or deterred with geographical distance, as product markets are generally integrated at a national level.

Furthermore, in SSA, foreign investment projects tend to concentrate in larger and capital cities where finance, infrastructure, labour force and other institutions are well developed (Kinda, 2013). This may make geographical proximity between domestic firms and foreign rivals easier, which in turn may enhance the flow of information. Hence, our fourth hypothesis is as follows:

Hypothesis 4: *Proximity matters for the workings of the spillover channels in SSA.*

5.2.4 Spillover channels and ownership structure

With regard to ownership structure, a recent study by Müller and Schnitzer (2006) hypothesizes that spillover effects vary with the degree of foreign ownership. Similarly, Takii (2005) argues that majority foreign ownership enhances the transfer of advanced foreign technology in the host country,

and thus the potential for spillovers, but may impede the extent of technology leakage. Conversely, a higher level of local participation, as is the case with minority-owned foreign subsidiaries, provides local firms the opportunity to become acquainted with advanced foreign technology, as this allows better access to specific foreign knowledge that enhances spillovers (Blomström and Sjöholm, 1999). However, the incentive to transfer new technology on the part of the foreign subsidiaries may diminish with a greater local ownership share (Crespo and Fontoura, 2007). In this regard, foreign subsidiaries may prefer a greater majority ownership to protect themselves from firm-specific knowledge and technology leakages. However, Takii (2005) further argues that foreign subsidiaries may not sufficiently control the extent of knowledge and technology leakages. If this is the case, the occurrence and extent of spillovers is likely to come about from majority rather than minority-owned foreign subsidiaries. The fear of technology leakages on the part of the latter may prohibit the transfer of advanced technology from the parent company. Hence, our last hypothesis is:

Hypothesis 5: *The occurrence and size of spillover effects in SSA is mainly driven by majority foreign-owned firms.*

The aforementioned theoretical perspectives pose various restrictions on empirical investigations. For instance, too often the empirical examination of the relative importance of the labour mobility channel (in terms of either technological or pecuniary spillovers) is difficult to investigate as it requires tracking workers employed or trained by foreign firms, including those who set up their own business. Furthermore, the literature is largely confined to formulating a linear relationship between productivity gains and FDI. However, there may also be a non-linear relationship in that spillovers might increase and then decline beyond a certain level of foreign presence (e.g., see Buckley et al., 2007b). In this regard, we also examine the possibility of a non-monotonic nature of spillover effects. Hence, this empirical investigation will take the hypotheses to be tested towards a better understanding of the FDI intra-industry spillover transmission channels for SSA firms. Importantly, it advances the lessons from the meta-analyses (Chapters 3 and 4).

5.3 Data and empirical approach

5.3.1 Data and descriptive analysis

We use a firm-level panel dataset obtained from the World Bank's Regional programme on Enterprise Development. The World Bank Enterprise Surveys are designed to provide longitudinal datasets using a stratified sampling approach (World Bank, 2014). The top priority of the surveys is to provide rich datasets to investigate the changes in the business environment that affect productivity at the firm level, both over time and across countries. The surveys cover the formal private sector and employ the same sampling methodology and survey instruments across all countries using three levels of stratification: region, sector and firm size.[3] Business sectors are defined in accordance with the International Standard Industrial Classification (ISIC) Rev. 3.1 2-digit classification.[4]

Table 5.1
Distribution of the firms by country and ownership

Country	*Number of Firms*						*% panel*
	Local		*Foreign*		*Total*		
	All	*Panel*	*All*	*Panel*	*All*	*Panel*	
DRC	740	150	148	34	888	184	12
Ghana	1,074	52	140	10	1,214	62	4
Kenya	1,212	146	158	20	1,370	166	10
Malawi	520	121	153	53	673	174	11
Senegal	1,007	457	100	19	1,107	476	30
Tanzania	1,055	45	87	5	1,142	50	3
Uganda	1,025	150	178	24	1,203	174	11
Zambia	886	225	318	79	1,204	304	19
Total	7,519	1,346	1,282	244	8,801	1,590	100

Source: Author's compilation using World Bank Enterprise Surveys.

As illustrated in Table 5.1, based on data availability we construct data from eight SSA countries (Democratic Republic of Congo, Ghana, Kenya, Malawi, Senegal, Tanzania, Uganda and Zambia) for the period 2006-2014. A standardized sampling strategy and questionnaire enabled us to construct this dataset of the aforementioned SSA countries. Although the dataset comprises 8,801 foreign and domestic firms, our investigation is restricted to 1,590 firms, as the empirical strategy requires a panel data

analysis (see Table 5.1). Of the panel sample, about 85 per cent are domestic firms. In terms of the number of establishments interviewed in each SSA country in the panel sample, Senegal represents the highest sample size: 30 per cent of the total panel sample. In contrast, Tanzania and Ghana are the countries with the lowest number of interviewed firms: respectively, three and four per cent of the total panel sample. The other SSA countries represent an approximately similar sample distribution of 10-19 per cent each. In order to standardize the data, we have converted all data from local currency units (LCUs) into US dollars and deflate them using gross domestic product (GDP) deflator (i.e., in US dollars with 2000 as the base year).[5]

Table 5.2 presents the ownership distribution of the firms. These figures comprise firm-level information for 8,801 firms in both surveys (3,632 in the first wave and 5,169 in the second wave). In the first wave, 3,632 firms were interviewed, but only 795 were re-interviewed in the second wave. Thus, 2,837 firms were surveyed only in the first wave and 4,374 firms were surveyed only in the second wave. Of the 4,374 firms surveyed only in the second wave, 72.9 per cent (3,188) of the firms commenced operations before the first wave. This means that a large number of firms started operation before the first wave but were not included in the first wave survey.

Table 5.2
Distribution of the firms according to ownership

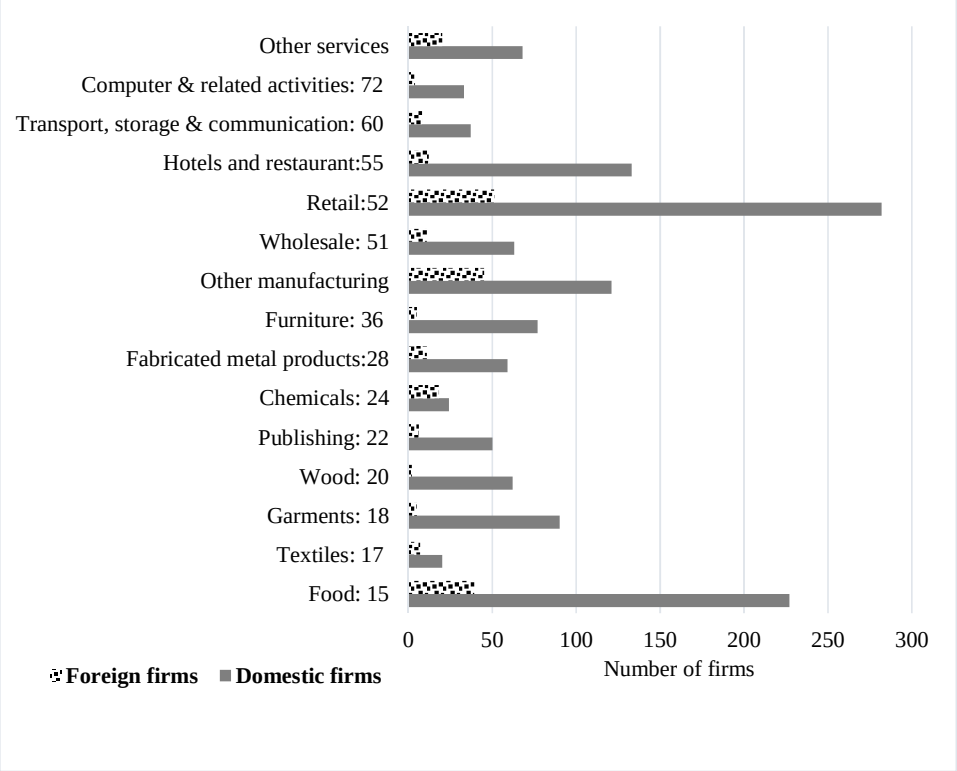
Year of survey	*Local firms*		*Foreign firms*		*Total*	
	All	*Panel*	*All*	*Panel*	*All*	*Panel*
First wave/2006	3,129	670	503	125	3,632	795
Second wave/2014	4,393	676	779	119	5,169	795
	7,522	1,346	1,282	244	8,801	1,590

Source: Author's compilation using World Bank Enterprise Surveys.

Another concern is whether the 2,837 firms interviewed only in the first wave and not included in the second wave were excluded due to exit from their industry or due to other systematic or non-systematic random factors. In the sample, if firms that drop-out differ systematically from firms that continue, then the information from the continuing firms is no longer representative of the whole sample. Hence, investigating the spillover effects only on continuing firms is not likely to provide consistent

findings. We therefore need to examine whether the attrition[6] is systematically associated with firm characteristics or is entirely random. We provide an attrition probit model where the dependent variable takes the value 1 for firms which drop-out after the first wave and 0 otherwise. Results of the attrition probit are provided in Table A5.1. The probit regression indicates that drop-out firms are not systematically different from retained firms at any conventional level, as none of the firm characteristics is statistically significant.

Figure 5.1
ISIC 2-Digit distribution of the firms by sector and ownership (N=1590)



Source: Author's compilation using World Bank Enterprise Surveys

Notes: Other manufacturing includes manufacture of tobacco (16), leather (19), paper (21), refined petroleum products (23), plastic and rubber (25), non-metallic mineral products (26), basic metals (27), machinery and equipment (29), electronics (31) and electrical machinery (32), precisions instruments (33) and transport machines (34). Other services include construction (45) and motor vehicle services (50).

Figure 5.1 shows a breakdown by ISIC 2-digit industry-level for domestic and foreign firms (panel sample). Both foreign and domestic firms have strong similarities in terms of industrial distribution as they, roughly, dominate in the manufacture of food products and beverages, and chemical and chemical products, in the retail trade, and in fabricated metal products. Domestic firms are also most likely to operate in the manufacture of garments, in wood, publishing, hospitality (hotels and restaurant) and in the furniture industries.

Table 5.3A
Summary statistics control and outcome variables (panel)

Variables	*All firms N=1578*		*Domestic firms N=1336*		*Foreign firms N=242*		*t-test for two-sample difference*
	Mean	*SD*	*Mean*	*SD*	*Mean*	*SD*	
Labour productivity	9.34	3.33	9.00	3.19	11.22	3.49	9.83
Exports	0.08	0.27	0.06	0.24	0.19	0.39	6.58
Foreign-owned	0.15	0.36	-	-	-	-	-
Firm size (5-19)	0.62	0.49	0.67	0.47	0.34	0.48	-9.77
Firm size (20-99)	0.26	0.44	0.24	0.43	0.35	0.48	3.50
Firm size (100+)	0.12	0.33	0.09	0.29	0.31	0.46	9.61
Firm age	16.65	13.41	15.96	12.83	20.46	15.79	4.85
Formal training	0.26	0.44	0.24	0.42	0.37	0.48	4.39
Technological gap	0.71	0.45	0.77	0.42	0.43	0.49	-10.85
Capital-labour ratio	0.037	0.153	0.034	0.151	2.07	2.41	1.33
Labour force	57.00	216.4	42.19	155.28	138.63	406.04	6.49

Source: Author's compilation using World Bank Enterprise Surveys.

Table 5.3A and 5.3B list summary statistics and Table A5.2 gives the definition of the variables. The commonly stylized facts found in the literature of FDI spillovers are also confirmed in our sample of panel data. Foreign-owned firms tend to be more productive, provide greater employment and formal training, operate for a longer period, are more adept at exporting and have a higher technological level. For instance, labour productivity is higher in foreign firms. Another key difference between the firms is the size of the technological gap. While the bulk of the domestic firms (77 per cent) fall into the large technological gap category, only 43

per cent of the foreign firms fall into this category. On average, foreign firms have 138 workers as compared to 42 workers in domestic firms. All these differences are statistically significant at 1 per cent. Moreover, foreign firms are likely to have operated for a longer period of time (on average 20 years). In terms of firm size, foreign firms appear to fall approximately equally in all three categories (see Table 5.3A for the three categories). In sharp contrast, the bulk of the domestic firms (67 per cent) fall into the small-sized firm category (i.e., 5-19 workers). However, exceptionally, both domestic and foreign firms are likely to be similarly endowed in terms of capital-labour ratio (measured in terms of expenditure on machinery, vehicles and equipment per worker). A possible explanation could be the higher level of employment in the foreign firms relative to domestic firms measured by the total number of employees.

Table 5.3B offers summary statistics for the spillover channels. The statistics are based on a clustered analysis of eight countries (Table 5.1) and 26 industries (Figure 5.1)[7]. The statistics show that the majority foreign-owned firms explain the spillover variables. This is also consistent with the competition channel that shows a lower mean value for majority foreign-owned firms. This is because competition in the local market is calculated as the difference between sales and costs over total sales so that a value close to 0 indicates heightened competition, with firms' prices close to costs (Narula and Marin, 2003). This indicates the existence of high competition within majority as opposed to minority foreign-owned firms. In this regard, minority foreign-owned firms stimulate a moderate level of competition that may induce local firms to cope and compete using their existing resources more efficiently or by adopting new technologies.

Table 5.3B
Summary statistics for spillovers channels (clustered by country & industry)

Spillover Channels	*All foreign firms: N=242*		*Majority foreign-owned: N=188*		*Minority foreign-owned: N=54*	
	Mean	*SD*	*Mean*	*SD*	*Mean*	*SD*
Demonstration	0.39	0.26	0.42	0.26	0.30	0.25
Labour mobility	32.9	0.21	41.2	72.3	3.57	19.05
Competition	0.18	4.90	0.07	5.55	0.58	0.47

Source: Author's compilation using World Bank Enterprise Surveys.

5.3.2 Empirical approach

We model spillover effects within the context of a production function framework in which output is a function of capital, labour and access to technology. With regard to the outcome variable, authors use a production function of either a one-step direct approach (e.g., see Aitken and Harrison, 1999; Hamida, 2013, Mebratie and Bedi, 2013) or a two-step indirect estimation technique (e.g., see Merlevede et al., 2014; Waldkirch and Ofosu, 2010). The former employs a direct approach to the FDI effect using labour productivity, output or value-added as the dependent variable. The latter uses an indirect approach using total factor productivity (TFP). We note that there is no consensus on the appropriateness of the one-step versus the two-step approach. However, Demena and van Bergeijk (2017a) suggest a one-step approach, given the field of this literature, is influenced by selection bias towards positive estimates. Hence, we opted for a direct approach of labour productivity.[8]

The empirical approach is estimated using the baseline equation 1:

$$\ln(LP_{ijt}) = \beta_0 + \beta_1 T_t + \beta_2 I_j + \beta_3 C_x + \beta_4 FDI_{ijt} + \beta_5 FDIs_{jt} + \\ + \beta_6 AC_{ijt} + \beta_7 TG_{ijt} + \beta_8 K_{ijt}/L_{ijt} + \beta_9 L_{ijt} + \alpha \sum X_{ijt} + \varepsilon_{ijt} \quad .....(5.1)$$

The subscripts *i*, *j*, and *t*, represent firm, industry and time respectively. The inclusion of a time dummy (T_t) accounts for any possible regional trends and economic events. Likewise, the inclusion of industry fixed-effects (I_j) account for unobservable time-invariant effects that may drive changes in labour productivity, such as, for instance, the attractiveness of a particular industry. A full set of country fixed-effects (C_x) is included to account for unobservable time-invariant heterogeneity in countries, such as, for instance, the attractiveness of a particular country (e.g., better infrastructure). The inclusion of time dummy, country and industry fixed-effects addresses the econometric concerns related to the omission of unobserved variables that may breakdown the exogeneity condition relevant to obtaining unbiased and consistent estimates.

Unlike existing studies where $FDIs_{jt}$ is measured through foreign share alone, this study disaggregates spillover measures into the abovementioned three channels. First, the imitation effect is measured as the share of total sales by foreign firms (see Hamida, 2013). The imitation effect

works via direct contact between local and foreign firms. This effect captures the knowledge about foreign firms' processes and products in the domestic market. After observing a new product or process innovation and allowing for its feasibility, domestic firms may strive to copy and use it (Meyer, 2004; Crespo and Fontoura, 2007). The idea is to examine the contribution of foreign firms to a product innovation or production process on the assumption that the greater the availability of new processes and products in the local market, the higher the potential for demonstration or imitation effects. The extant empirical literature suggested three measures for imitation spillovers, namely, foreign share in sales, employment and equity. As illustrated in the introductory section (Section 5.1), approximately half of the empirical studies reviewed by us indicate sales may capture the best spillover through the imitation channel.

Second, the worker mobility channel is measured using the interaction term between foreign presence and labour force in terms of the number of employees in the domestic firms (Sinani and Meyer, 2004; Hamida, 2013).[9] This variable is assumed to measure the combined effect of the presence of a foreign share in an industry on domestic firms' productivity levels and the level of labour force in local firms. This interaction investigates the worker mobility-determined spillover in the domestic market that is supposed to be co-determined by the interaction of these two variables.

Third, following Chung (2001) and Narula and Marin (2003), the competition effect is measured by a firm's price mark-up. We use the differences between a firm's total sales and its costs over total sales to measure price mark-up. The firm-level price mark-up is an appropriate measure of the level of competition (Hamida, 2013). When the price mark-up is close to 1 or when there is a high mark-up, competition is low. Conversely, when it is close to 0, competition is higher. A decrease in the mark-up is therefore an indication of heightened competition. This follows a negative coefficient associated with a decrease in the mark-up (increased competition), followed by an improvement in domestic productivity (Chung, 2001).

We also include a measure for foreign ownership (FDI_{ijt}), absorptive capacity (AC_{ijt}), technological gap (TG_{ijt}) and a set of control variables (X_{ijt}), outlined in Table 5.4, and the time-variant error term (ε_{ijt}). The extant literature indicates X_{ijt} to include the number of years since the establishment of the domestic firm, whether a firm exports, and the size of the firm. One

possible reason for this inclusion could be that larger and older local firms are expected to influence their labour productivity, as these firms are likely to have sufficient production space and scale (e.g., see Aitken and Harrison, 1999; Crespo and Fontoura, 2007). According to the World Bank's survey, size consists of three dummy categories in terms of the number employees at the local firm.[10] Moreover, export is also likely to affect a local firm's performance as exporting firms are assumed to have international experience. The dummy variable takes a value of 1 if a local firm exports and 0 otherwise (Kinuthia, 2016; Lu et al., 2017).

Table 5.4
Definition of variables

Variables	***Description***
Exports (*Ex*)	Firm exports (see Greenaway et al., 2004; Kinuthia, 2016; Lu et al., 2017)
Foreign-owned (*Fo*)	Foreign-owned firm if foreign participation is at least 10 per cent (see Aitken and Harrison, 1999; Chudnovsky et al., 2008; Kinuthia, 2016; Mebratie and Bedi, 2013)
Firm size (5-19 workers)	Size of the firm is small (see Aitken and Harrison, 1999; Bwalya, 2006; Crespo and Fontoura, 2007; Mebratie and Bedi, 2013)
Firm size (20-99 workers)	Size of the firm is medium (see Aitken and Harrison, 1999; Bwalya, 2006; Crespo and Fontoura, 2007; Mebratie and Bedi, 2013)
Firm size (100+ workers)	Size of the firm is large (see Aitken and Harrison, 1999; Bwalya, 2006; Crespo and Fontoura, 2007; Mebratie and Bedi, 2013)
Firm age	Number of years in operation (see Aitken and Harrison, 1999; Chuang and Lin, 1999; Mebratie and Bedi, 2013)
Formal training (*Tr*)	Formal training programmes for employees (see Cheng, 2011; Chudnovsky et al., 2008; Chung and Lee, 2015)
Technological gap (*TG*)	The ratio of average foreign productivity to domestic productivity in the same country and sector (see Haddad and Harrison, 1993; Hamida, 2013; Haskel et al., 2007; Kinuthia, 2016; Kokko, 1996)
Capital-labour ratio (*K*/*L*)	The logarithm of expenditure on machinery, vehicles, and equipment per worker (see Aitken and Harrison, 1999; Blomström and Sjöholm, 1999; Bwalya, 2006; Lu et al., 2017; Mebratie and Bedi, 2013)
Labour force (*L*)	The total number of employees in a firm (see Aitken and Harrison, 1999; Bwalya, 2006; Hamida, 2013; Kinuthia, 2016; Mebratie and Bedi, 2013)
Imitation (*I*)	Share of total sales in a given industry accounted for by foreign firms (see Crespo and Fontoura, 2007; Hamida, 2013, Meyer, 2004)
Labour mobility (*LM*)	The interaction of foreign presence and human capital (see Hamida, 2013; Meyer and Sinani, 2002, 2004)
Competition (*C*)	Price mark-up at firm-level through the differences between a firm's total sales and costs over total sales (see Chung, 2001; Hamida, 2013; Narula and Marin, 2003)
Labour productivity (ln*LP*)	Logarithm of a firm's annual total sales per worker (see Aitken and Harrison, 1999; Bwalya, 2006; Chudnovsky et al., 2008; Mebratie and Bedi, 2013)

With regard to the technological gap, following Kokko (1996) among others, we use the ratio of the average productivity of foreign-owned firms in relation to domestic firms' own productivity in a given industry and country (see also Haddad and Harrison, 1993; Haskel et al., 2007; Kinuthia, 2016). To split our sample into small and large technological gap, we use a dummy variable that takes the value 1 if the domestic firms' productivity is below the average productivity of foreign firms and 0 otherwise (see Jordaan, 2005; Hamida, 2013; Kinuthia, 2016). When the local firms function at about the same level of productivity of labour in relation to foreign affiliates in a given industry, the technological gap is interpreted as small. In contrast, when the labour productivity of local firms is less than or far behind its foreign competitors in an industry (i.e., the average technological frontier of an industry), the technological gap is interpreted as large. This means that when the dummy is 1, the gap is high, whereas when the dummy is 0, the gap is small.

For absorptive capacity, we use a dummy variable that takes the value 1 when a domestic firm provides formal training programmes for its employees, and 0 otherwise (see Cheng, 2011; Chudnovsky et al., 2008; Chung and Lee, 2015). Although recently Chung and Lee (2015) have reported absorptive capacity to be measured through its origin[11], i.e., the licensing of foreign technologies, they also acknowledge the importance of on-the-job training programmes as an alternative way to build absorptive capacity. Our data do not contain variables that would adequately capture the licensing of foreign technologies.

In terms of empirical estimation, given the two period panel, we performed a set of econometric tests to arrive at a better model estimation. First, we adopt the Breusch-Pagan Langrange multiplier (BP-LM) test. The BP-LM, which is chi-squared with one degree of freedom, revealed the test for random-effects to be 230.27 with a p-value of less than 0.001, significant at any conventional level. This allows us to reject the null hypothesis that the pooled OLS method is efficient in favour of the random-effects model. Next, we apply the Hausman test that suggests that the random-effects model is not appropriate, indicating the appropriateness of fixed-effects (the test for fixed-effects is 107.28 with a p-value less than 0.001). To shed light on the issue of multicollinearity, we have investigated the issue of correlation among all the variables if one or more variable is strongly correlated with other variables as illustrated in Table A5.2. As can be seen from the estimated correlation matrix, all correlation coefficients

uniformly indicate the absence of any variable with a pairwise correlation in excess of -/+0.7, suggesting multicollinearity is not a problem.

Following the empirical strategy outlined above, several econometric concerns are addressed. The first issue is the omission of unobserved variables. We address this issue by including time-invariant fixed-effects as well as a time dummy and a set of time-variant firm-level variables. Second are concerns related to endogeneity or potential selection bias. For instance, if a foreign firm gravitates into the most productive industry, then the observed result on productivity will overstate the impact of FDI. The best way to address this possibility is to estimate fixed-effects (Konings, 2001; Hanousek et al., 2011; Mebratie and Bedi, 2013). In addition to the usual econometrics of panel data, an estimation of fixed-effects is, therefore, likely to mitigate for the possibility of reverse causality from domestic productivity to foreign investment. Third, we conduct further analysis and a set of several robustness checks for the sensitivity of our results, as well for any possible measurement errors, through alternative specifications. All of these empirical approaches address econometric concerns that may have biased the estimates of previous research. Importantly, we adopt a set of lessons from recent meta-analyses (Chapters 3 and 4).

5.4 Estimation results and discussion

5.4.1 Spillover transmission channels

A set of different estimations are presented in this section. We start by testing whether the three spillover channels should be included separately or simultaneously in equation (5.1). The Wald test justifies the simultaneous estimation of the three channels at the 1 per cent statistical significance level. To better visualize the results and keep the table manageable, we report only results relating to the transmission channels (estimations that include all variables are provided in Appendix A5.3).

Table 5.5, column A, gives the results from the fixed-effects model, testing our first hypothesis for the full sample data. This estimation (A) gives the statistically significant effects of the three transmission channels. *I* (Imitation) indicates that FDI has a positive spillover effect on domestic productivity. A 10 percentage point increase in foreign presence is associated with a 17 per cent increase in the labour productivity of domestic firms, indicating the presence of technological spillovers. The findings

support the theoretical position that foreign affiliates speed up access to and transfer of new products and processes in the host economies (Wang and Blomström, 1992; Meyer, 2004).

Table 5.5
Main results: transmission channels, technological levels and absorptive capacity

Variables	*Full sample (A)*	*Small gap (B1)*	*Large gap (B2)*	*Low AC (C1)*	*High AC (C2)*
Imitation ***(I)***	1.670** [0.537]	25.404*** [7.102]	-2.043** [0.594]	1.734** [0.677]	1.214 ** [0.488]
Labour mobility ***(LM)***	0.0004* [0.0002]	-0.0005 [0.002]	0.001** [0.0004]	-0.0002 [0.0005]	-0.0002 [0.001]
Competition ***(C)***	0.00002* [0.00001]	0.044*** [0.006]	0.002*** [0.0001]	0.00002 [0.0001]	-0.005*** [0.001]
$\bar{R}^2$	0.93	0.42	0.33	0.94	0.96
Observations	1,576	441	1,135	1,171	405

Notes: Results are from fixed-effects estimates. Robust standard errors in [ ] are clustered at country level. * p<0.1; ** p<0.05; *** p<0.01. The dependent variable is the logarithm of the labour productivity of domestic firms. Regressions include time, country and industry dummies. Control variables included are medium-sized firm, large-sized firm, firm age, capital-labour ratio, exports, FDI firm, Labour force, absorptive capacity, and technological gap. Column A gives estimations from local firms altogether. Columns B1 and B2 represent local firms with small and large technological difference vis-à-vis foreign firms in a given industry, respectively. Columns C1 and C2 refer to local firms with low absorptive capacity and high absorptive capacity respectively. In order to avoid multicollinearity and ensure better estimates, all continuous variables used for interactions are centred by subtracting the full sample means (Aiken and West, 1991).[12]

The estimated coefficient of the labour mobility channel is positive and significant. In this regard, the interaction of foreign presence *(I)* and labour force in terms of domestic employees *(L)* appears to reveal that domestic labour productivity significantly depends on the local labour force in response to foreign presence. However, such spillover benefits are far smaller than those gained via the imitation channel. Furthermore, competition *C* is positive and significant. This channel indicates that an increase in competition generated by FDI presence impedes the productivity of domestic firms. This indicates the presence of negative and significant pecuniary spillovers. Again, note that *C* is statistically significant but the effect is smaller than that of *I*.

The main message in the results of column A, therefore, corroborates our first hypothesis that the occurrence, sign and size of spillover effects

vary with respect to the channels through which they emerge. This important finding implies that the resulting estimates using the share of foreign presence alone cannot describe a fuller picture of spillover effects. In this regard, it is seemly to investigate the three spillover channels simultaneously in order to capture a more nuanced influence of FDI. Our next concern is the recognition that firms are not equally affected by spillover effects from FDI. Accordingly, in the next section, our study goes further to separate domestic firms according to their technological levels and absorptive capacity.

5.4.2 Spillover and technological level of domestic firms

We estimate two separate regressions for our measure of the technological gap. Columns B1 and B2 in Table 5.5 give the results of technological levels, thus testing the second hypothesis. B1 and B2 present the results for small and large technological gaps, respectively.

Our main findings seem to confirm that spillovers are a positively related to a higher technology level. Domestic firms with a higher technology level seem to experience significant positive spillover effects from the imitation channels (B1 versus B2). That is, firms with a small technological gap are better at identifying and exploiting the introduction of new technological opportunities associated with the presence of FDI into the local market. This evidence is consistent with that obtained by Kinuthia (2016) for Malaysian firms. In contrast, domestic firms with a relatively large technological gap seem to be hit significantly by the presence of foreign counterparts, or fail to reap spillover benefits from imitation. *I* in column B2 may suggest the presence of a reverse spillover effect.

With regard to labour mobility, this is positive and statistically significant in the large technological gap group, indicating an increase in domestic productivity. This confirms the results obtained by Hamida (2013) who found that such firms can benefit greatly via the worker mobility channel, as this can contribute to technical assistance that allows such firms to better understand and use foreign technologies.

C becomes significant and positive for both technological groups, indicating the presence of pecuniary spillovers, but the size is far smaller in B2 than in B1. These results indicate the presence of significant market-losing effects, demonstrating a negative pecuniary spillover. In this respect, both types of firms seem unable to cope with competition from

foreign firms. However, firms with a small technological gap appear to lose a more significant local market share than firms operating in industries with a large technological gap. Bearing this scenario in mind, a limited local technological difference (vis-à-vis foreign firms) appears to create a relatively high level of direct competition between domestic and foreign counterparts, consistent with the theoretical suggestion by Jordaan (2005, 2008). In contrast, in line with the Jordaan's hypothesis, a large local technological gap results in a situation where the level of direct local market competition is relatively modest, minimizing the occurrence of negative pecuniary spillovers.

The findings also confirm what we discover for the full sample in column A, Table 5.5, which shows that the high technology firms appear to dominate in terms of spillover benefits. This corroborates our second hypothesis that the workings of the channels and the size of the effects vary according to domestic technological levels. The benefit is much larger for SSA firms with smaller technological differences in relation to foreign firms. Firms with a large technological gap appear to benefit limited spillovers only through the labour mobility channel. The findings also appear to support the theoretical assumption of labour economics (for instance, Becker, 1964) and the recent theoretical model of FDI-induced spillovers by Fosfuri et al. (2001). These models suggest that worker mobility is likely to occur when the on-the-job training is general rather than specific as may be the case in low technological firms.

Our evidence is contrary to the original theoretical formulation of Veblen-Gerschenkron (VG) effects (and Findlay, 1978) that indicate that technological effects will take place faster when there is a greater relative technological gap. This was the basic theoretical assumption behind a number of developing country policies attempting to attract FDI in high technology sectors (Fan, 2002). By contrast, our evidence indicates that this is not a valid assumption. Rather, the productivity of SSA's domestic firms appears to benefit from foreign entry when the technological gap is smaller, supporting the theoretical assumption of Lapan and Bardhan (1973), among others.

5.4.3 Spillover and absorptive capacity of domestic firms

Table 5.5 gives the results of the channels that vary in terms of absorptive capacity, thus testing the third hypothesis.

With regard to the imitation channel, it appears that domestic firms in both groups internalize spillover gains. This suggests that firms in the low absorptive capacity group are also apt to understand and imitate foreign knowledge. This is consistent with the findings obtained by Hamida (2013) that suggest that firms with low absorptive capacity are likely to gain spillover benefits only through the imitation of foreign technology. Furthermore, *C* is negative and significant only for firms characterized by high absorptive capacity, suggesting that firms with low absorptive capacity do not internalize spillover benefits through competition effects (C1 versus C2). This is because a negative and significant *C* implies that a decreased mark-up (heightened competition) is followed by an increase in domestic productivity, i.e., positive pecuniary spillover. Considering this scenario, the competitive pressure generated by foreign presence encourages domestic firms with high absorptive capacity to work harder to exploit existing resources and technology more efficiently in order to improve productivity via competition effects.

Again, we continue to find similar results of the full sample. Furthermore, we also continue to find a more nuanced picture of the transmission channels and spillover effects. The findings confirm that high absorptive capacity firms are able to cope and fiercely compete with foreign counterparts that induce them to use their existing technology and resources more efficiently and imitate advanced foreign technologies in line with the absorptive capacity hypothesis and empirical results found by Narula and Marin (2003) and Hamida (2013).

5.4.4 Further investigations and robustness checks

In this section, we make further analyses to test the remaining (fourth and fifth) hypotheses and to carry out several robustness checks related to our findings outlined above. The former analysis deals with the questions of ownership structure and geographical proximity. The latter explores the sensitivity of our findings to the: (1) construction of the spillover variables; (2) construction of the outcome variable; (3) introduction of a set of industry-time interaction dummies; and (4) estimation method.

a) Further investigation: foreign ownership structure

In columns D1 and D2 in Table 5.6, we allow the construction of spillover channels to vary in terms of minority and majority foreign-owned firms. We do this by dividing the previous version of foreign ownership into two

variables. In column D1, we define majority foreign ownership as 50 per cent or more ownership, and set the variable to zero if ownership is less than 50 per cent. Similarly, column D2 presents minority foreign ownership as less than 50 per cent ownership (but at least 10 per cent).

Table 5.6
Further results: ownership structure and geographical proximity

Variables	*Majority-owned FF (D1)*	*Minority-owned FF (D2)*	*Located main city (E1)*	*Geographical dispersion (E2)*	*Located outside city (E3)*
Imitation ***(I)***	1.575** [0.505]	-0.244 [1.321]	4.124*** [0.938]	1.686** [0.538]	0.245 [0.152]
Labour mobility ***(LM)***	0.0005* [0.0002]	0.003 [0.007]	0.0006** [0.0002]	0.0004* [0.0002]	0.0004*** [0.0001]
Competition ***(C)***	0.002** [0.004]	-0.359* [0.178]	-0.000 [0.000]	0.00002* [0.00001]	0.00002** [0.0001]
Gini				0.006* [0.003]	
Non-local Imitation					-0.0005** [0.0002]
Non-local Labour mobility					0.000 [0.000]
$\overline{R}^2$	0.93	0.93	0.94	0.93	0.93
Observations	1,576	1,576	942	1,576	1,576

Note: Results are from fixed-effects estimates. Robust standard errors in [ ] are clustered at the country level. * p<0.1; ** p<0.05; *** p<0.01. The dependent variable is a logarithm of the labour productivity of domestic firms. Regressions include time, country and industry dummies. Control variables included are medium-sized firm, large-sized firm, firm age, capital-labour ratio, exports, FDI firm, Labour force, absorptive capacity, and technological gap. Column D1 refers to majority-owned foreign firms with at least 50 per cent foreign ownership, whereas column D2 represents minority-owned foreign firms with less than 50 per cent but at least 10 per cent foreign ownership. Column E1 estimates only for firms located in the eight largest and capital cities. Column E2 gives results that include *Gini* variable to proxy for the geographical distribution of industries. Column E3 represents results showing the extent to which foreign firms are located outside the region. In order to avoid multicollinearity and ensure better estimates, all continuous variables used for interactions are centred by subtracting the full sample means (Aiken and West, 1991).

Our findings corroborate the view that it is the advanced technology of majority foreign-owned firms that mainly drives the spillover benefits (D1 versus D2). A possible explanation for this is that foreign investors may be more inclined to bring their proprietary technology with them

when they have majority ownership control over subsidiary operations. Furthermore, majority foreign-owned firms enhance the workings of the worker mobility channel to some extent, but impair benefit from the competition channel (via market loss). The latter may indicates that domestic firms encounter a relatively higher level of local market competition from majority foreign-owned firms than from minority foreign-owned firms, a situation in which foreign presence stimulates a negative pecuniary spillover effect. The benefits of majority foreign-owned firms are similar to the estimated effect on the full sample (Table 5.5 column A). Findings for the imitation spillover are consistent with results obtained by Merlevede et al. (2014) and inconsistent with those reported by Fatima (2016)[13] using the foreign-owned share alone.

Column D2, on the other hand, shows that minority foreign-owned firms appear to induce spillover benefits only through the competition channel. This suggests that minority foreign-owned firms only drive competition spillover benefits. Considering this scenario, minority foreign-owned firms may represent a situation in which the level of direct local market competition is relatively modest, maximizing the occurrence of positive pecuniary spillovers. This can be an indication that minority foreign investors are unwilling or unable to take along their most advanced technologies to host countries, thus limiting the scope of imitation and worker mobility spillovers. In this respect, our findings support the hypothesis that the occurrence and size of spillover effects is predominantly driven by majority foreign-owned firms. The findings in this thesis are consistent with results obtained by Merlevede et al. (2014) for Romanian manufacturing firms and support the hypothesis that the occurrence and size of spillover effects is predominantly driven by majority foreign-owned firms.

b) Further investigation: spillover effects and geographic proximity

To examine geographical proximity, first we provide estimates only for firms located over the eight largest and capital cities (column E1 in Table 5.6).[14] In terms of both sign and significance of the channels, E1 corroborates the corresponding estimates in column A in Table 5.5 estimated across the eight SSA. However, unlike the estimate in column A, *C* in E1 appears to generate an insignificant effect, minimizing the occurrence of negative pecuniary spillover effects. The magnitude of *I* is much larger and the differences are statistically significant. This is in line with the notion

that geographical proximity or concentration of industries enhances the magnitude of spillover effects mainly through the workings of the imitation channel.

In in terms of the concentration of firms in the largest and capital cities, Grether (1999) and Jordaan (2008a) provide a measure of the geographical distribution of an industry. They find a positive association between the labour productivity of Mexican firms and the level of geographical distribution of an industry. This indicates the importance of controlling for the distribution of firms over geographical location. The level of the geographical distribution of industries over the regions in the SSA countries included in the dataset is captured using the *Gini* variable. Even though the *Gini* coefficient is usually used to measure the level of income inequality, we follow Grether (1999) and Jordaan (2008a) to obtain an indication of the level of distribution of industries over geographical regions. We capture the *Gini* variable using the share of a particular regional industry in relation to the total regional employment level divided by the share of a national industry in relation to the total national employment. In this sense, a high *Gini* coefficient suggests a high level of geographical agglomeration of industries.

Column E2 gives the estimates that include the *Gini* variable as a proxy for the geographical distribution of industries. First, consistent with Grether (1999) and Jordaan (2008), *Gini* is significant. This indicates that the level of geographical agglomeration of industries has a significant association with measured labour productivity. This is in line with the notion that the geographical concentration of economic activities (industries) can facilitate the existence of agglomeration economies. Specifically, this can lead to the creation of better information spillovers. Second, the current estimated spillover effects corroborate the corresponding findings in column A in Table 5.5. This is can be an indication that the initial omission of the *Gini* variable is not causing an omitted variable bias, as the estimated spillover effects remain unaltered.

Consistent with the theoretical predications made by Girma (2005) and Jordaan (2005), the current findings indicate larger positive spillover effects when firms are geographically located in close proximity, in particular from *I* (column E1 versus column A). The main difference is that the effectiveness of the spillovers varies in terms of the channels as observed in columns E1 and E2. The labour mobility channel is likely to generate positive and significant effects, but these are not different from estimations

based on the full sample (in both columns E1 and E2 versus column A). Consistent with Glass and Saggi (2002), this may reflect the tendency in a developing country context to not stimulate the movement of labour, regardless of geographical proximity. The workings of the competition channel report the absence of a negative pecuniary effect (E1). However, the workings of the imitation channel are consistent with the theoretical expectations of Girma (2005) and Jordaan (2005). Our results support the hypothesis that geographical proximity or concentration is likely to enhance the workings of the imitation effects and impede the negative competition effect. This is observed in either the relatively larger magnitude for *I* (in E1 versus A) or the minimizing (vanishing altogether) of the presence of negative pecuniary spillovers for *C* (in E1 versus A).

Furthermore, we attempt to demonstrate the workings of the channels in terms of spillover effects from foreign-owned industries in both the same city/region and those outside the city/region. We do this by dividing foreign presence into two variables: the effect of FDI presence within the same region and the effect of FDI located outside a particular region. The estimation results are presented in column E3 in Table 5.6. Compared to the findings when all firms are taken together in column A in Table 5.5, column E3 shows that local firms are likely to suffer when foreign firms are located outside the region (i.e., in more distant regions) via the imitation channel, consistent with Lu et al., (2017). Unlike the highly significant result of *I* in column A, column E3 reports the absence of evidence. Furthermore, there is no evidence of labour mobility (*LM*) from foreign firms located in regions that are more distant.

c)Robustness checks

The robustness checks using various sensitivity analyses uniformly confirm our main findings and in some cases report further evidence.

Construction of the spillover channels with the exclusion of exports

As is commonly done in the literature, the measure of foreign presence involves the inclusion of all the sales by foreign firms, even if a substantial share of their sales are exported.[15] In this regard, the use of total sales in the construction of the spillover variables in terms of the share of total sales in a given industry by foreign firms may overestimate the actual effect. In order to address this measurement concern, we re-conduct the effect of the presence of foreign firms by excluding sales accounted for by

exporting foreign firms. Column F in Table 5.7 gives an estimation of this analysis as a robustness check. In general, compared to the estimation of the full sample in column A in Table 5.5, column F corroborates the corresponding results of spillover effects. Specifically, we continue to find a positive and statistically significant effect of *I*, but the magnitude gets smaller though the difference is not statistically significant. This is consistent with the hypothesis that the inclusion of sales from exports by foreign firms could result in an upward bias of the magnitude of the spillovers. In this scenario, the magnitude of *I* is reduced, whereas *LM* becomes insignificant (column A versus column F). In this regard, our findings suggest that export-oriented foreign firms may reduce the spillover benefits from imitation and the possibility of spillover gains from the movement of workers disappears completely. However, the workings of the competition channel remains unaltered, suggesting that the local market share/competition is not reduced by exports.

Non-linear spillover effects

In general, the literature is largely confined to investigating linear spillover effects. However, as indicated by Buckley et al. (2007b) and recently by Lu et al. (2017), there is a possibility that spillover effects may be non-linear. To test for a curvilinear transmission channels, we include the squared terms of the three spillover variables in Eqn. 5.1. Column G in Table 5.7 gives the results confirming the relevance of curvilinear spillover effects.

Specifically, we continue to find a positive and highly significant *I* effect, the size of which may be even larger. In this regard, and consistent with the linear estimation, a 10 percentage point increase in foreign presence is associated with an 18 per cent (as opposed to a 17 per cent in column A in Table 5.5) increase in the labour productivity of domestic firms. However, I^2, using the non-linear estimation, reports the existence of negative and insignificant imitation spillover effects when the level of foreign penetration goes beyond a certain point. In this light, I^2 becomes insignificant after the share of foreign presence is greater than 59 per cent, in which case the benefits disappear altogether. However, there is no evidence for either linear or non-linear *LM*. The competition channel, that also points to the non-linear specification, shows that an increase in competition generated by FDI enhances the productivity of domestic firms. This indicates the presence of positive and significant pecuniary spillovers (i.e., statistically significant but the benefit is smaller than the imitation

channel). The relatively smaller size of the C^2 (which is not different from zero), as compared to *C*, shows decreasing spillover effects when the level of competition goes beyond a certain point due to an increase in FDI.

Table 5.7
Robustness checks

Variables	*Exports excluded (F)*	*Non-linear effect (G)*	*Alternative FDI (H)*	*Industry * time (I)*	*Alternative productivity (J)*	*Alternative estimation (K)*
Imitation ***(I)***	1.575* [0.751]	1.763*** [0.415]	1.136** [0.428]	1.552** [0.582]	1.236** [0.526]	0.848*** [0.315]
Labour mobility ***(LM)***	0.0008 [0.0005]	0.0002 [0.0007]	0.0004* [0.0002]	0.0002* [0.0001]	0.0005** [0.0002]	0.0001 [0.0001]
Competition ***(C)***	0.00002* [0.00001]	-0.0001* [0.00005]	0.00002* [0.0001]	0.00001** [0.000005]	-0.0001*** [0.00001]	0.00001*** [0.000002]
Imitation^2 ***(I^2)***		-1.493 [1.690]				
Labour mobility^2 ***(LM^2)***		0.000 [0.000]				
Competition^2 ***(C^2)***		-0.000* [0.000]				
$\bar{R}^2$	0.93	0.93	0.93	0.93	0.86	0.93
Observations	1,576	1,576	1,576	1,576	1,524	1,576

Notes: Results are from fixed-effects estimates. Robust standard errors in [ ] are clustered at country level. * p<0.1; ** p<0.05; *** p<0.01. The dependent variable is a logarithm of the labour productivity of domestic firms. Regressions include time, country and industry dummies. Control variables included are medium-sized firm, large-sized firm, firm age, capital-labour ratio, exports, FDI firm, Labour force, absorptive capacity, and technological gap. Column F represents the exclusion of exports from the construction of the foreign presence variable. In column G, results are from the non-linear spillover effects (i.e., the inclusion of squared spillover variables in the regression). Column H introduces an alternative measure of foreign presence: the dummy instead of the share version of the spillover variables. Column I replaces the separate industry and time dummies with a set of industry-time interaction dummies. Column J uses an alternative measure or definition of labour productivity: the value added per worker rather than the sales per worker. Column K replaces the fixed-effects estimation method with the random-effects method. In order to avoid multicollinearity and ensure better estimates, all continuous variables used for interactions are centred by subtracting the full sample means (Aiken and West, 1991).

Considering both I^2 and C^2, this means that spillovers have a non-monotonic relationship with FDI, where the positive effects are dominant when there is low or moderate foreign presence but begin to decrease as the level of foreign presence exceeds a certain level: it seems that foreign firms are more likely to protect their advanced technology more actively

after the share of foreign presence reaches beyond 59 per cent. In the theoretical model by Das (1987), the existence of learning from watching by local firms may encourage foreign affiliates to transfer more superior technology. A similar situation is described by Wang and Blomström (1992): when there is a high level of local competition, more advanced technology has to be transferred by foreign firms to keep their competitive advantage, enhancing the potential for spillover gains. However, in our sample, after the foreign share exceeded the inflection point (i.e., 59 per cent), we see a situation in which a foreign affiliate is faced with a higher level of competition and thus protects its technological superiority more actively. This is consistent with the hypothesis by Glass and Saggi (2002).

Alternative measure of foreign presence

In Table 5.7, column H introduces the dummy instead of the share version of the spillover variables and column I replaces the separate industry and time dummies with a set of industry-time interaction dummies. The spillover results in columns H and I corroborate the corresponding findings in column A in Table 5.5. However, unlike the estimate in column A, the magnitude of *I* in column H appears to reduce substantially and the difference becomes statistically significant. This can be attributed to the alternative measures of foreign presence. That means that, in terms of the share of foreign firms in an industry's sales, the imitation channel contains more information than the dummy version.

Alternative measure of domestic firms' productivity and estimation method

In Table 5.7, columns J[16] and K replace the definition of our outcome variable and use estimation of the random-effects method, respectively. Column J uses the value added per worker rather than the sales per worker definition of labour productivity. Our main findings in relation to spillover results are again confirmed. Generally, the results are an indication that the use of either of the definitions of labour productivity does not make much difference for the spillover analysis. However, *C* reports negative and significant effects (though the magnitude is still small), confirming the existence of positive pecuniary spillovers, as is the case in the estimation of firms with a high absorptive capacity (C2), for minority foreign-owned firms (D2) and for non-linear spillover effects (G). In another robustness check, column K replaces fixed-effects with random-effects in our spillover estimation method. Again, our main findings in column A in Table 5.5 are confirmed.

5.5 Conclusions

One of the main reasons why policy-makers in developing countries pay special attention to attracting FDI inflows is the expected valuable productivity gains (Buckley et al., 2007b; Hamida, 2013, van Bergeijk, 2009). The substantial increase in FDI penetration in developing countries has, in turn, spawned a substantial empirical literature seeking to measure the spillover effects. This literature has mainly attempted to measure FDI spillover effects using foreign ownership alone. According to Hamida (2013), this approach captures only the effects of imitation or contagion spillovers. Tian (2007) indicates that the share of foreign presence offers only a partial picture of spillover effects, and thus cannot capture the overall effect. Kokko (1996) and Wang and Blomström (1992) argued that competition-determined spillover effects cannot be represented by the presence of foreign ownership alone. The analysis in this chapter substantiates that an approach that only considers foreign ownership cannot fully describe how spillover effects actually emerge, mainly as such an analysis disregards other channels. Furthermore, the literature largely presumes that spillovers occur evenly across firms, for example nine out of ten of the existing effects are considered to emerge irrespective of the absorptive capacity and technological level of domestic firms.

To overcome the gap, this thesis allows spillover effects to vary according to various different transmission channels, and also seeks to separate domestic firms in terms of their technological level and absorptive capacity. Using unexplored recent panel data on SSA, our results, although in line with the theory, yield different results to the extant empirical literature on FDI spillovers in developing countries.

First, productivity gains to domestic firms depend on the specific transmission channel. In the full sample, FDI presence generates significant spillover benefits through both imitation and labour mobility, but fails to do so through the competition channel. The findings on competition supports the existence of negative pecuniary spillover effects, signalling the occurrence of market-losing effects. The magnitude of the spillover effects are far larger for the imitation effect relative to the labour mobility channel, and the difference is statistically significant and remains stable across several specifications.

Secondly, a similar spillover pattern appears for firms in the smaller technological difference group, showing that it is local industries with high

technological levels which predominately contribute to the total spillover effects found in the full sample, mainly via the imitation channel. Industries with a large technological gap appear to gain spillovers only through the labour mobility channel. This may be an indication that these industries can only use foreign technology through this channel as labour mobility facilitates skills acquisition to implement foreign technology. It also implies that market-losing effects are stronger amongst firms in industries characterized by a small technological gap. This limited technological difference may represent a situation in which there is a direct, relatively high level of competition between local and foreign counterparts. The findings do not support the Veblen-Gerschenkron theoretical assumption. Rather, they support the technology accumulation hypothesis.

Thirdly, both low and high absorptive firms benefit from imitation-determined spillovers. However, only local firms with a relatively high level of absorptive capacity absorb the competition-determined spillovers. This is in line with the theory that absorption is not purely about imitation (Narula and Marin, 2003; Hamida, 2013). Instead, only firms that have invested significantly in their absorptive capacity are able to internalize the FDI spillover gains more efficiently.

Fourthly, the benefits from imitation and worker mobility are driven mainly by the advanced technology of majority foreign-owned firms; a higher industry share in SSA. When there is a smaller foreign industry share, minority foreign-owned firms appear to generate spillover effects only through the workings of the competition channel. Accordingly, our results suggest that mainly majority-owned firms drive the knowledge spillover, whereas minority-owned firms stimulate the allocative efficiency spillover. The latter may be an indication that minority-owned firms are unwilling or unable to bring their advanced technologies to the domestic economy as a lower degree of managerial control may reduce the incentive to transfer technology to their subsidiaries. Furthermore, the effect of geographical proximity or concentration enhances the magnitude of spillover effects and influences the workings of the transmission channels differently. This is consistent with the notion that geographical proximity enhances the existence and magnitude of spillovers, though mainly via enhancing imitation effects and reducing the existence of negative competition effects. The results are consistent with this notion of geographical proximity but are somewhat contrary to the theoretical predictions by Jor-

daan (2005) and Girma (2005) for the workings of both the labour mobility and competition channels. Last, the magnitude of the imitation effect is softened and the gains from the movement of workers effect vanish altogether with exports. The analysis of the non-linear spillover effects points to declining (vanishing) spillover benefits after an increase in FDI penetration goes past a certain point.

Our findings suggest that gauging FDI-induced spillovers is both a complicated process and a challenging issue. Each spillover transmission channel needs to be identified and delineated clearly, and the effects of each of the channels needs careful and separate investigation before any meaningful and robust conclusions about spillover effects can be reached. Future studies should also direct the investigation towards approaches that allow the channels to vary according to the length of time a foreign company has been present in host countries. Unfortunately, our dataset does not allow us to identify duration since first entry. Alongside firm-level heterogeneity, technological characteristics, varieties of mode of entry, the country or nationality of the FDI source, and the motives for foreign production also need future investigation.

Notes

[1] An article based on this chapter has been submitted for peer-review. The paper benefited from the useful discussions and suggestions at the 2nd IGAD Economic Conference, 2015; the 4th AfricaLics PhD Academy, 2016; the 18th ETSG Annual Conference, 2016; and conferences at the Ugandan Ministry of Finance, Planning and Economic Development, 2016; and the Economic Policy Research Center (EPRC) based in Uganda, 2016.

[2] Recently, Kinuthia (2016) has attempted to provide transmission channels in a comparative context in Kenya and Malaysia. The author, consistent with extant literature, provides estimated coefficients using foreign share alone. However, this has been documented capturing spillovers associated only with the imitation or contagion effects. Moreover, as Kinuthia (2016) pointed out, due to the high pairwise correlation among the proxies for foreign presence, estimated results are presented separately. In this case, on the one hand it seems that the proxies are measuring the same effects. On the other hand, owing to a high correlation between the error term and the non-included channels, a separate estimation of spillover chan-

nels could result in biased estimates. A recent study by Fatima (2016) also recognizes the well-established channels or mechanism through which intra-industry spillovers emerge, but fails to investigate these empirically.

[3] For a thorough presentation of the sampling methodology, see:

<http://www.enterprisesurveys.org/methodology>. Accessed 14 January 2016.

[4] For a detailed discussion of the ISIC, see:
<http://unstats.un.org/unsd/cr/registry/regcst.asp?Cl=17>. Accessed 20 January 2016.

[5] We obtained all data related to exchange rates and GDP deflators from the World Development Indicators <http://data.worldbank.org/data-catalog/world-development-indicators>. Accessed 18 July 2016.

[6] Attrition is described as a nightmare for panel researchers as firms which drop out from a panel may differ systematically from firms which continue. This may result in a non-representation of the original population of firms, making interpretation of estimates problematic (Winkels and Withers, 2000).

[7] For the list of the industries, see <http://www.enterprisesurveys.org/~/media/GIAWB/EnterpriseSurveys/Documents/Methodology/ES_Manufacturing_Questionnaire.pdf >. The Enterprise Survey A.4 Industry Questionnaire contains 27 industries. However, the datasets for SSA do not contain information about recycling industry type (37).

[8] McKenzie (2011) indicates that labor productivity is important for generating long-run growth and creating job opportunities for the young and growing African labour force. Buckley et al. (2007a) and Mahmood (2008) also point out that the use of labour productivity is an appropriate outcome variable, as it is potentially important in improving living standards and wages in the domestic economy.

[9] Instead of a local firm's labour force, the labour quality of the local firms would be a better proxy for the labour mobility channel with the interaction of foreign presence. Our firm-level data does not contain this information.

[10] One would expect that firm size dummy variables to correlate with the labour force variable. However, as can be seen in Table A5.2, these variables indicate the presence of weak pairwise correlation.

[11] Chung and Lee (2015) suggest measuring AC in terms of its origin after defining it as local firms' ability to undertake R&D. They distinguish three forms of origin for AC: know-how-only licensing, know-how-and-patent licensing and patent-only licensing. These three origins of AC collectively known as licensing of foreign technologies. However, they also acknowledge the importance of other measures of AC, such as, for instance, on-the-job training, worker education and overseas training.

[12] For instance, the correlation between the share of foreign presence, human capital and their interaction is 0.182 and 0.765 before centring and 0.086 and 0.515 after centring, respectively.

[13] Indeed, Fatima (2016) concludes that the results of intra-industry spillovers in terms of the impact of foreign ownership share are not consistent with conventional theory.

[14] These are Kinshasa (DRC), Accra (Ghana), Lilongwe (Malawi), Dar es Salaam (Tanzania), Kampala (Uganda), Lusaka (Zambia), Dakar (Senegal) and Nairobi (Kenya).

[15] In our case, 19 per cent of the foreign firms export their output (See Table 5.3A).

[16] Because of missing information, 52 domestic firms are dropped when we replace the sales per worker definition of labour productivity with the value added per worker.

6 FDI and spillovers in Uganda: evidence from a recent survey of firms[1]

Abstract

This chapter explores the intra-sector spillover effects of FDI on domestic firms' productivity. Aiming to identify how spillover effects actually emerge, theoretically our inquiry draws on three spillover channels as opposed to a single variable approach. Empirically, our analysis is based on unique firm-level qualitative data collected from 33 on-site semi-structured interviews with firms operating in Uganda. The results of our analysis suggest that long-term pecuniary spillover effects are predominantly stimulated via the competition channel. It also shows that both short-term and long-term technological spillover effects occur through the imitation and the movement of workers channels. These channels, however, are not only less prevalent but also appear to be constrained by competition-determined spillovers. These findings challenge the single spillover variable approach, and suggest the importance of in-depth and detailed analysis of each spillover channel.

6.1 Introduction

FDI is widely considered to be a component of a country's development strategy (van Bergeijk, 2009). One main reason of this is the possibility of local firms gaining access to FDI spillover effects (Buckley et al., 2007b; Hamida, 2013; Merlevede et al., 2014). Broadly, these effects are considered to include processing, production, and distribution technologies as well as marketing and management skills to enhance productivity or efficiency (Blomström and Kokko, 1998). The occurrence of such effects may

emerge via three channels: imitation, movement of workers, and competition (e.g., see Aitken and Harrison, 1999; Wang and Blomström, 1992).

As discussed in the theoretical Chapter 2 and empirical Chapter 5, the existing theories clearly distinguish the three different spillovers channels. The empirical studies however only deal with aggregated spillover effects. This is partly because these empirical studies merely aim to investigate whether the presence of FDI affects local firms' productivity. These studies typically use a so-called 'single variable approach' in the form of the share of foreign presence alone. The implicit assumption is that the whole picture of spillover effects can be captured by the share of FDI presence alone or that the effects are identical irrespective of the channel. Recall that the single variable approach merely offers a partial description of spillover effects, as foreign share is only one means of analyzing the effects (Hamida, 2013; Tian, 2007).

In addition, Kokko (1996) and Wang and Blomström (1992) argued that competition-determined spillover effects cannot be represented by the presence of foreign share alone. Furthermore, spillover effects might not be identical with respect to the channel they flow through or be fully captured by disregarding certain channels. For example, while increased competition induced by foreign presence is an incentive for domestic firms to use existing resources and technology more efficiently, or even to adopt new technologies, at the same time competition may generate market loss and crowding out effects. Another example is that skilled workers who have worked for foreign firms might move to the domestic firms, but there is also a possibility that foreign firms might poach skilled local workers or stop them from switching to local firms.

Examination of FDI spillovers is predominantly carried out via econometric analysis. However, the extant empirical econometric analyses do not allow for a more complete and detailed description of the channels. For instance, the relative importance of the worker mobility channel requires us to investigate whether foreign firms poach local workers, whether workers who previously worked for foreign firms setup their own business or both. In this respect, this chapter is aiming at a qualitative examination of the pertinence of the hypotheses outlined in the previous chapter. Our main motivation to carry out such an examination is that, to the best of our knowledge such a qualitative analysis has thus far not been explored. Hence, this examination is an important contribution of this thesis to the study of FDI spillover effects.

Against this backdrop, this chapter aims to investigate FDI spillover effects via the transmission channel focusing on Uganda. For this, we used on-site interviews with 33 domestic and foreign firms carried out in Uganda in 2015, secondary quantitative data collected from the Ugandan Investment Authority (UIA), expert interviews and document analysis. Uganda was chosen for the following four reasons. First, we preferred to focus on one of the eight SSA countries included in the earlier chapter in order to maintain consistency in terms of countries being investigated. Second, Uganda is more attractive than several other African countries in creating a favourable business operating environment for FDI (Riddervold, 2011). For instance, the 2015 Index of Economic Freedom ranked Uganda 92 out of 178 countries, while Tanzania and Kenya ranked 109 and 122, respectively. Furthermore, in the SSA region, Uganda is ranked the 4th freest economy. Third, Uganda heads several African countries in terms of the incentives it offers for FDI (Colen, 2009). For instance, the government allows full repatriation of profits and 100 per cent foreign ownership (UIA, 2015a). Fourth, the rapid growth of FDI into the manufacturing sector has made Uganda an exciting case to investigate (Rasiah, 2009).

The remainder of this chapter is set out as follows: Section 6.2 sketches the features and trends of FDI in the Ugandan economy. Section 6.3 describes the data collection process, and discusses the concepts, measurements and data. Section 6.4 presents the detailed results. Section 6.5 concludes.

6.2 The setting: trends and features of FDI in Uganda

This section explores the features and trends of FDI mainly using quantitative data obtained from UIA and qualitative data from senior Ugandan officials interviewed by the author.[2]

6.2.1 Background

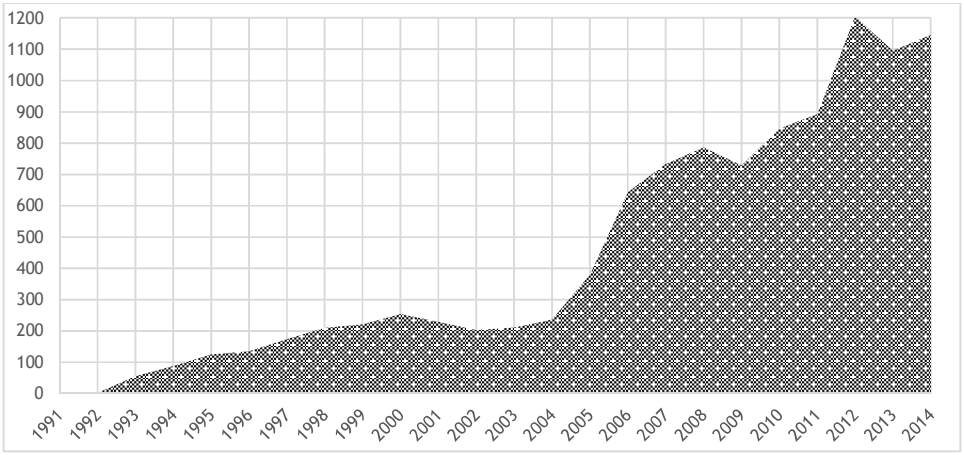
Since the 1980s, increasing numbers of developing countries have started to set policies to facilitate FDI inflow in order to accelerate growth and development. Among the developing countries in the East African region, Uganda is no exception. The UIA was established by a new law 'investment code 1991',[3] to govern investment in Uganda, and introduced various incentive packages[4] (UIA, 2015a). The broad mandate of the UIA is

to promote, facilitate and oversee private sector investment in Uganda by way of international workshops and distributing promotional materials to explain the foreign investment opportunities in Uganda (Mr. Valentine Ogwang[5]; UIA, 2015b)[6]. It is also mandated to collect and publish information regarding investment incentives, private investment licences, and to inform as well as recommend policies to the Ugandan government that will enhance private investment (UIA, 2015b).

6.2.2 Trends in FDI

Many of the foreign-owned firms in Uganda attribute their motivation to come and operate in the country to the UIA (Riddervold, 2011). After the establishment of the UIA, there was a gradual increase in FDI until 2004, followed by a significant expansion (as in Figure 6.1). FDI increased from a mere US$1 million in 1991 to US$0.2 billion in 2004 and then saw a remarkable rise to US$1.205 billion in 2012 – an all-time high. After a 9 per cent decline in 2013, FDI reached US$1.147 billion in 2014.

Figure 6.1
Trends of FDI inflow in millions US$ at current prices (1991-2014)



Source: Author's compilation using various World Investment Reports by UNCTAD.

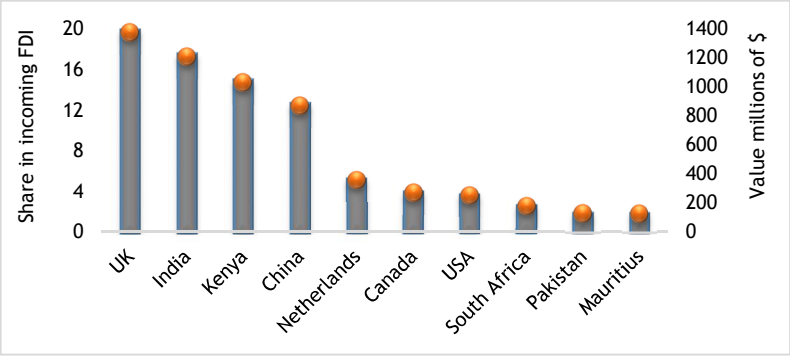
The upward trend of FDI in Uganda is a promising indication of greatly improved investment opportunities (recall the 2015 Index of Economic Freedom rank). This may be an indication that the country has become

more attractive than other countries in the region. Furthermore, diversity[7] in terms of the origin of the foreign firms investing in Uganda is an indication that the local market has generated private investment interest globally. Hence, the adoption of friendly business instruments and the decline of business opportunities[8] in many other countries of the region assisted Uganda in attracting FDI that would otherwise have relocated to other countries (Rasiah, 2009; Riddervold, 2011).

6.2.3 Who is investing?

The main foreign investment players in Uganda are UK, India, Kenya and China (Figure 6.2). The UK has accounted for the largest share of foreign investment since 1991.

Figure 6.2
Top ten FDI source countries *in millions US$ at current prices* (1991-2013)



Source: Author's calculation using data from the UIA, 2015.

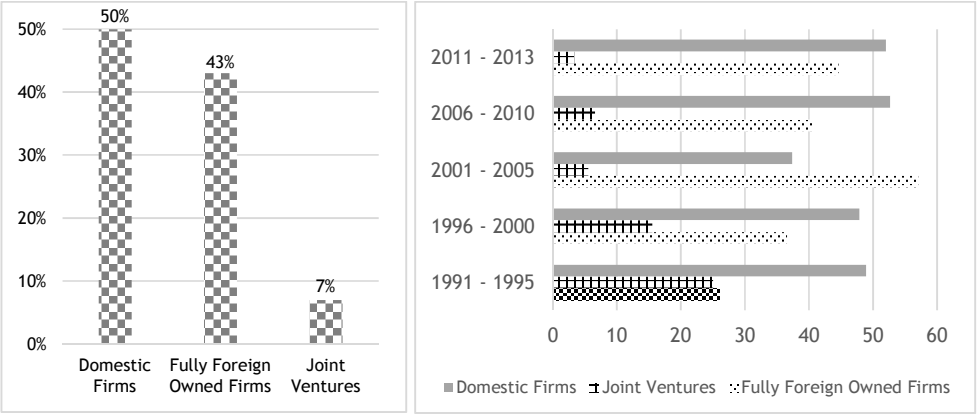
UK investment accounted for one-fifth of the total foreign private investment in the period 1991-2013. This is mainly because the UK, due to its past as a former colonial master, is a traditional trading partner. In this regard, Ogwang added that the Government of Uganda has continued to expand and shield investment from the UK in order to maintain that country's presence and beneficial ties. India is the next largest source of foreign investment with 17 per cent of the total investment. Three African countries are ranked in the top 10 FDI countries of origin. Kenya contributed 15 per cent of the total investment, the third largest FDI source, whereas

South Africa and Mauritius ranked 8th and 10th, respectively. Chinese involvement in the Ugandan market is mainly attributed to the launch of its 'Go out' policy in 2000 (Warmerdam and van Dijk, 2013b). China accounts for 12 per cent of the foreign private investment. Consequently, the Ugandan economy absorbed 64 per cent of foreign private investment that originated from the UK, India, Kenya and China. The other top ten players are Netherlands, Canada, USA, South Africa, Pakistan and Mauritius, which together comprise 19 per cent of foreign investment.

6.2.4 How is the investment financed?

Figure 6.3 presents the distribution of firms according to their ownership status as registered at the UIA. Foreign investors, either as full owners or as jointly with Ugandans, have financed half of the investment projects during the period 1991 - 2013. Specifically, 43 per cent of the investment was financed by fully foreign-owned firms, while 7 per cent were joint ventures established with Ugandans. The share of fully foreign-owned firms continued to increase after the inception of the UIA - with less than 10 per cent in 1991 to 62 per cent in 2013. The exception is in the period between 2006 and 2010 that shows a sharp decline in investment by the firms which are fully-owned by foreigners. This may be attributed to the deepening of the financial crisis that began in September 2007.[9]

Figure 6.3
Distribution of firms by ownership status in millions US$ at current prices (1991-2013)



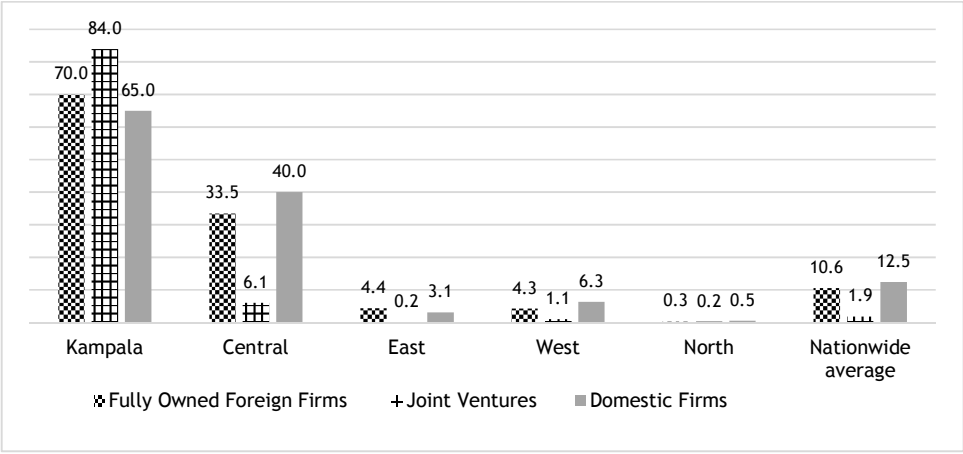
Source: Author's calculation using data from the UIA, 2015.

Apart from the period 2001 – 2005, local establishments dominate the Ugandan economy in terms of ownership structure. Moreover, foreign joint venture investments with local businesses have uninterruptedly declined since the inception of the UIA. This indicates that joint ventures form a less important mode of foreign investment entry into the Ugandan economy. It should, however, be noted that the final period (2011 – 2013) is not completed as data for 2014 and 2015 cannot be obtained from UIA.

6.2.5 Where is the investment?

As illustrated in Figure 6.4, investment projects are located in four regions. The Central region, including Kampala, has the highest share of investment projects. Four out of five of the established projects are located in the Central region and the other three regions all together constitute only about 20 per cent of the total investment. Indeed, private investment in the latter regions falls below the nationwide average for their respective ownership status. Put differently, about 80 per cent of the fully foreign-owned firms, domestic firms and joint ventures investments are concentrated in the Central region.

Figure 6.4
Composition of firm ownership by region in millions US$ at current prices (1991-2013)



Source: Author's calculation using data from the UIA, 2015.

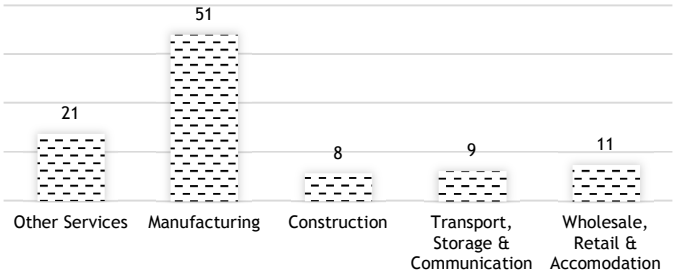
According to Ogwang, infrastructural availability, financial development, institutions and human capital development largely drive the concentration of investments in the Central region. A study conducted by Du et al. (2008), for instance, reports that regions with better institutions encourage more investments. Urata and Kawai (2000), considering Japanese establishments in developing countries, also confirm the importance of infrastructure.

Within the regions, the bulk of the investments are located in five major cities: Kampala in the Central region, Bbale and Jinja in the Eastern region and Lira and Gulu in the Northern region (Riddervold, 2011). In the Central region, Kampala accounts of 70 per cent, 84 per cent, and 65 per cent of fully foreign-owned firms, joint ventures, and domestic firms, respectively. This indicates that the majority of private investment is located in Kampala.

6.2.6 What are the private investors investing in?

Figure 6.5 gives the industrial distribution of foreign and domestic investment projects in the non-agricultural, formal private Ugandan economy. These investment projects are broadly broken down by the 2-digit ISIC.

Figure 6.5
Percentage composition of industrial distribution in millions US$ at current prices (1991-2013)



Source: Author's calculation using data from the UIA, 2015.

Slightly more than half (51 per cent) of the investment projects are attributed to the manufacturing sector. Firms in this sector largely concentrate on the manufacturer of food products and beverages, and metal and

metal products, which accounted for 23 per cent and 16 per cent respectively in 2013 for the three ownership types (Table A6.1 in Appendix). Other manufacturing sectors include rubber and plastic products, chemical and chemical products, machinery and equipment, paper and paper products, tobacco products, and electrical machinery and apparatus. According to the expert interview with Dr Dick Kamugasha,[10] the Ugandan manufacturing sector is mainly engaged in import-substitution activities. This may imply that the manufacturing sector is mainly local market oriented and that FDI in Uganda is mainly local market seeking.

The services sector accounts for the other 49 per cent of FDI. It includes wholesale, retail, accommodation, construction, transport, storage, communication and other services. In this sector, investment exhibited a steady reversal between local and fully foreign-owned investments. For instance, in 2009, the share of the former was 54 per cent and the latter accounted for 44 per cent. However, in 2013 the fully foreign-owned firms accounted for 61 per cent, whereas local investment reached its lowest share in five years (33 per cent). The implication is that the services sector attracts more private foreign investors rather than Ugandans, suggesting there may be a number of market-losing and/or crowding out effects.

In sum, the FDI inflow trend in Uganda shows significant improvement since 1991 when the country began recording capital inflows. Many authors note that, as is the case in Uganda, FDI inflow into developing countries is the main, if not the only, source of new technologies (e.g., Dupasquier and Osakwe, 2006; Navaretti et al., 2004). The central question is whether firms in developing countries such as Uganda benefit from such entry and operation of foreign firms. If so, the question is how these spillover benefits actually emerge.

6.3 Methodology and data

This section first explains the procedure that was followed to select a set of firms for interviews. Next, it discusses the problems encountered while trying to reach the selected firms, describes the actual firms that were interviewed and the data collection technique. Third, it presents the questions that were used for the interviews as well as related concepts and measurements. Finally, it summarizes the main characteristics of the interviewed foreign and Ugandan firms.

6.3.1 Data sample and source

As a first step in conducting the interviews, we collected the list of firms operating in Kampala from the database of the Ugandan Bureau of Statistics (UBOS). UBOS is a central statistical information service in the country and all firms are required to register on its enterprise census. To identify a sub-group representing the full population of firms, a random sampling method was applied by using Microsoft Excel. The procedure of this was as follows: first, we applied the 'rand' function to generate random numerical values for all firms. Next, firms were listed according to their random values. Assuming an interviewee rate of 50 per cent, we selected 60 firms (about 10 per cent of the population) to represent a random sample of the 561 firms operating in Kampala.

After the firms were selected for an interview, we searched various internet sources for additional firm-level information as supplement to the UBOS database. The aim of this search was intended to obtain general information about the firms, including a description of their activities, their industry type and ownership status. After that, we sent emails to the selected firms, mostly to the contact person listed in the UBOS database or the manager of the firm, inviting them to participate in the research. The research permit from the Uganda National Council for Science and Technology (UNCST) (Figure A6.1), a researcher's letter that described the main objective of the research project and an overview of the structured interview questionnaire was attached to the email. The email communication was followed up with several phone calls requesting an appointment for an interview.

Table A6.3 provides a summary of the respondents. In most of the cases, a senior employee, generally the operations manager, managing director or general manager were interviewed. The main criterion for the selection of the interviewee within these selected firms was that he/she had enough knowledge about the firm and a good understanding of the research topic, so that they could provide detailed information about the research objective. The vast majority of the interviewees were senior staff members who had been with the firm for a long time, making it possible to historically explore how the production process of existing products, the production of new products, and the distribution technology were influenced by the entry of foreign firms. In addition, the interviews offered

a good opportunity and access to conduct on-site observations of the production process and of production technology. As to the gender distribution, only four of the respondents were female.

6.3.2 Interview and data

Although we attempted to interview 60 firms as mentioned above, as can be seen in Table 6.1, the final sample only consisted of 33 successfully interviewed firms, an interview rate of 55 per cent. The reasons for this were - six firms were not willing to cooperate, 16 were not accessible (13 firms were not available at their physical address, and for three firms the geographic location was missing in the UBOS database), four were not non-agricultural formal private firms, and one had not started operation (see Table A6.2). As a result, we had to exclude 27 firms selected for interview.

Table 6.1
Interviewed firms by sectors and ownership

Interviewed industry type	*Domestic*	*Foreign*	*Total*
Manufacture of textiles	1	0	1
Manufacture of chemicals and chemical products	2	2	4
Hotels and restaurants	3	1	4
Transport	1	1	2
Communications	2	0	2
Construction	1	3	4
Manufacture of non-metallic mineral products	0	1	1
Manufacture of food products and beverages	1	0	1
Manufacture of machinery and equipment	0	2	2
Manufacture of fabricated metal products	1	1	2
Wholesaler and retailer	0	4	4
Sale, maintenance and repair of motor vehicles	0	1	1
Other manufacturing	1	0	1
Other services	4	0	4
Total number of firms interviewed	17	16	33

Source: Author's compilation based on the on-site interviews, 2015.

All the interviews were conducted by the PhD researcher. This ensured consistency in the data collection process. The technique of data collection that we chose is the semi-structured interview. We believe that this technique can provide a good balance between an open-ended interview that

cannot adequately deal with our main objective and a close-ended interview that strictly and narrowly categorizes the response. Using a semi-structured interview allowed us to gather a bit more in-depth information about the topic while guiding the discussions with the interviewee. It also elicited the opportunity to consider additional questions arising from the discussion and comments made during the interviews.

In most cases, with the consent of the interviewees, the full interviews were audio-recorded. Six respondents did not agree to be recorded and so notes were taken of their interviews. On average, the interviews took about half-an-hour. After the first round of interviews, some firms were revisited or phoned for further clarification or additional information. The actual survey took six months, February – July 2015 inclusive.

We transcribed all the recorded interviews as soon as possible after conducting the interviews in order to be able to include fresh interview information and observations from memory. While undertaking the interviews, from time to time, preliminary information and observations were shared and discussed with the field adviser in order to reflect on the data as well as the progress of the fieldwork. As to the coding of the data, the interviews were coded by the researcher. In most cases, a theory-driven data coding (a priori coding) strategy was used to search for the transmission channels and their effects on local firms. This was the case for the codes that had been pre-identified during the systematic review stage of the primary study. However, in some cases, a data-driven coding (emergent coding) strategy was also applied. For instance, local firms that have been simultaneously both positively and negatively affected had not been previously documented in this literature.

6.3.3 Concepts and measurements

In this section, we present the main concepts used in the questionnaire and their measurements in order to examine spillover effects from FDI. With regard to domestic firms, first we tried to find out the principal activities of the establishment. Second, we explored whether there were any spillover benefits or costs (broadly speaking in terms of product, process, and distribution technology received from foreign presence in a given sector). If so, third, we investigated how the technology from foreign firms was transferred to the local firms, in order to thereby understand the nature of the transmission channels. In particular, we explored the three

spillover transmission channels: whether it was transferred by the imitation of foreign technology available in the market; by recruiting workers trained by or who worked for foreign affiliates; or by the increased competition induced by the presence of foreign rivals forcing domestic firms to use existing resources and technology more efficiently or to adopt new technologies. If there were no spillovers, we tried to find out why spillover failed to take place. We also sought to understand whether the domestic firms experienced poaching of skilled local workers by the foreign rivals or market loss. Fourth, we sought to comprehend how the nature of the firms' characteristics outlined below affect the occurrence of spillovers. Fifth, we looked at the geographical proximity of foreign presence and the importance of this in maximizing spillover effects on nearby domestic firms. Appendix Table A6.4 gives the list of questions discussed with the interviewed Ugandan firms.

With the foreign firms, the questionnaire was intended first to explore the principal activities of the establishment as well as its reasons for choosing to do business in Uganda. Second, we wanted to find out whether the motive to choose the present location resulted in the expected benefits. Third, we strove to understand how domestic employees were hired, whether they were offered any training, whether they (could) leave after having worked for or being trained by the foreign firms and how the foreign firms stopped domestic employees from leaving. Appendix Table A6.5 presents the list of questions discussed with the interviewed foreign firms.

In reference to the desire to investigate how firm-level heterogeneities can affect the nature and occurrence of expected spillovers, we explored the following firm-level characteristics. First, the concept of absorptive capacity. Absorptive capacity became widely recognized after it was first introduced in the influential article by Cohen and Levinthal (1989). Following this seminal work by Cohen and Levinthal (1989), Narula and Marin (2003:23) defined absorptive capacity as referring to '... the ability [of firms] to internalize knowledge created by others and modifying it to fit their own specific applications, processes and routines'. One of the interviews with the domestic firms confirms the point that absorptive capacity is not only about imitation per se, but also requires the domestic firms to have the ability to understand and internalize external knowledge before potential spillover effects can materialize. For instance:

We may not imitate 100 per cent what they [the foreign counterparts] are doing, but first we go and try to understand how specific technology works. Once we have understood how it works, then we do our own research to develop something or a similar process/product. We try to understand the background. Because once you understand something it is easier for you to internalize or change it, if it has a problem. [Mr. Allan Kibirige, Operations Manager, Peacock Paints, interview conducted on 14th May 2015]

This quote is similar to that of Kim (1998), who noted that absorptive capacity needs leaning capacity and problem solving capacity. Kim argues that the former represents the capacity to assimilate knowledge (for imitation) and the latter refers to the capacity to create new knowledge (for innovation). A similar observation is provided by Zahra and George (2002) who differentiate between two important elements of absorptive capacity, 'potential' and 'realized'. The former represents the acquisition and assimilation of knowledge generated externally, whereas the latter refers to the successful implementation of such knowledge. In relation to the fact that some scholars, including Cohen and Levinthal in their influential article, regarded absorptive capacity as a subset of technological capacity, recently Chung and Lee (2015) observed that the key difference lies in its source or origin. Chung and Lee (2015) measure absorptive capacity via the licensing of external (foreign) technologies but acknowledge the importance of on-the-job training programmes as an alternative way of building absorptive capacity. In this light, since absorptive capacity is not directly measured, we use the provision of a formal employee training programme to indicate the presence of absorptive capacity.

Second, we consider the technological gap between domestic and foreign firms. The technological gap hypothesis states that spillover emerges faster either when the relative technological gap between foreign and domestic firms is large (Findlay, 1978; Wang and Blomström, 1992), or small (Lapan and Bardhan, 1973; Cohen and Levinthal, 1989). In this context, Kokko et al. (1996) suggest that Uruguayan firms with a small or moderate technology gap in relation to foreign firms are more likely to be able to make use of foreign technologies which will result in spillover effects. On the other hand, large gaps may signal that foreign technology is irrelevant to domestic firms as the products manufactured by foreign firms are very different from products manufactured by local firms. In this regard, we stuck to the domestic firm's self-image in relation to how they consider their own technological level vis-à-vis foreign firms in a given sector. In this context, a large technological gap may indicate that local and foreign

firms use different technologies, or manufacture different products although they are categorized as being in the same sector.

Third, the experience (age) of the firm in years since inception and the size of the firm measured by numbers of employees are also associated with the capacity of domestic firms and their success in reaping the benefits from the entry and operation of foreign firms. For instance, Aitken and Harrison (1999) argue that small firms are more likely to be hit significantly by the presence of foreign firms. The hypothesis therefore is that older and larger domestic firms can perform better because they are likely to have sufficient production space and scale to attract workers, and to imitate and compete with foreign firms (Crespo and Fontoura, 2007).

Fourth, it is argued that exporting domestic firms are more likely to benefit from foreign affiliates through their capacity to imitate foreign technology and their strength to fiercely face and cope with foreign competition (Greenaway et al., 2004). In contrast, the relevance of local market oriented foreign firms may decrease when domestic firms concentrate more on exports, and thus the potential for spillover effects from foreign affiliates in the local market become less important (Crespo and Fontoura, 2007). In addition, Blomström and Sjöholm (1999) argue that local market oriented foreign firms cannot be expected to create potential spillover benefits for export-oriented domestic firms as the latter already face substantial competition in the foreign market. In this regard, we asked the firms in the sample whether they are local market oriented or export market oriented or both. Note that from the expert interviews, it transpired that FDI in Uganda is mainly local market seeking, hence exporting domestic firms in the sample may find little to benefit or learn from foreign presence.

Fifth, domestic firms tend to experience spillover benefits when they operate in the same locality as or are physically closer to foreign firms (Blalock and Gertler, 2008). The main reason is that spillover transmission channels are reinforced first through neighbouring domestic firms and then spread to geographically more distant firms (Aitken and Harrison, 1999; Jordaan, 2012; Hamida, 2013). Hence, the potential for spillover transmission is assumed to reduce with distance (Girma, 2005; Greenaway et al., 2004). More specifically, Girma (2005) argues that: first, imitation effects, at least initially, benefit neighbouring domestic firms or firms that operate in the same region as foreign firms. Second, labour mobility is likely to be confined to the same locality, and, finally, economic geography

indicates that spillovers are transmitted more effectively within geographic proximity or across a smaller distance. In this respect, according to Jordaan (2005), unlike both the labour mobility and imitation channels where the effect appears to be effective, the competition channel does not seem to be clear-cut in terms of the geographical distance effect.

In order to account for the geographical dimension, we use information provided by the respondents in order to indicate the presence of nearby foreign firms and to determine how far a domestic firm is located from a foreign firm in a given sector. We first identify whether respondents feel the presence of any foreign rivals located in their neighbourhood, and if so, measure the distance between the two firms.

6.3.4 Data description: main characteristics of the interviewed firms

Table 6.2 gives basic characteristics of the interviewed firms. More than four out of five of the foreign firms interviewed are medium- and large-sized enterprises. Conversely, the majority of the domestic firms (59 per cent) are small-sized and 23 per cent are medium-sized enterprises. In terms of the numbers of employees, the median number of employees in the domestic firms is merely 15 workers, while that of foreign firms is 62 workers. This confirms that the vast majority of domestic firms in developing countries are small, employing only a few workers. For instance, Hsieh and Olken (2014) find that in Mexico, Indonesia and India, 90 per cent of the domestic firms employ fewer than 10 workers each. Likewise, in Nigeria, McKenzie (2015) reports that 99 per cent of the domestic firms employ fewer than 10 workers.

The average age of the interviewed domestic and foreign firms is 12 and 15 years, respectively. That means that foreign firms generally operate for a slightly longer period. With regard to the technological level of the domestic firms relative to the foreign firms, approximately, three out of five of the domestic firms fall into the large technological gap category. This suggests that the majority of the domestic firms in the sample are involved in technologically low-level activities.

About 63 per cent of the interviewed foreign firms have an employee training policy as compared to only 35 per cent of the interviewed domestic firms. Among the sectors in the sample, the formal training is fully provided in the chemical and chemical products, transport, storage and communication, fabricated metal products, textiles and garments sectors.

However, only 25 per cent of the interviewed foreign firms and domestic firms in the construction, the wholesale and retail, and the hospitality sectors have a formal employee training policy. The interviews show that the main motivation for both domestic and foreign firms to provide formal employee training is skill specialization. Skill specialization is seen as a great conductor of skill and knowledge transfer to local employees working for foreign affiliates.

Table 6.2
Basic characteristics of interviewed domestic and foreign firms

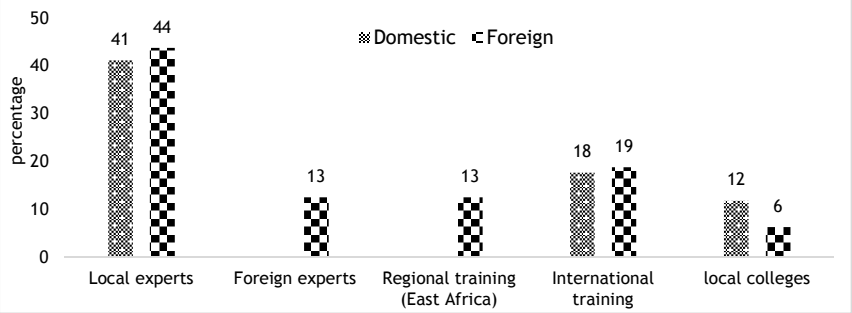
Variable	*Domestic*	*Foreign*
Average firm age	12	15
Median firm age	11	14
Small size (5-19 workers)	10	3
Medium size (20-99 workers)	4	8
Large size (100+ workers)	3	5
Median employment/workers	15	62
Formal training	35%	63%
Technology gap	Small: 41%; Large: 59%	-
Market orientation	4 firms also export	
Greenfield FDI	-	88%
FDI majority ownership	-	75%

Source: Author's compilation based on the on-site interviews, 2015.

Figure 6.6 presents the methods of formal employee training. There is a strong similarity of training methods between the domestic and foreign firms interviewed. Both typically search for and use local experts to train employees. The advantage of hiring local experts to provide training is that it is easier and much less expensive as well as being more practical in the local context. In the sample, international training including international visits, workshops, and exhibitions in foreign countries, is the second most frequently mentioned training method. For instance, to quote an interview with a domestic firm:

> *I have been taking my workers to Germany and England. In England, I want them to learn screen-printing and how they mix the colours. In Germany, they have to go and learn about the machines, about computerized embroidery. [Mrs. Margaret Odaka, Managing Director, Peggy Garments, interview conducted on 14th April 2015]*

Figure 6.6
Percentage of firms reporting on methods of formal employee training



Source: Author's compilation based on the on-site interviews, 2015.

However, the main difference between the domestic and foreign firms interviewed appears in relation to the use of foreign experts and regional training. None of the domestic firms interviewed uses such training methods. As explained by the domestic firms, this is because the cost of inviting foreign experts or attending regional trainings is extremely high for them. International training programmes are also very expensive for the domestic firms, but the firms indicated that such programmes are generally funded or supported by foreign organizations geared specifically towards local capacity building. Another difference in the training methods is that domestic firms appear to be better in using local colleges. In this case, the interviewed domestic firms funded twice as many trainings as the interviewed foreign firms at local universities, vocational schools, or colleges.

Generally, firms provide their products and services for either the local market or for exports. The majority of both the foreign and domestic firms in the sample mainly trade in the local market. About 25 per cent of all the firms interviewed (foreign and domestic) trade in regional markets such as in South Sudan, Rwanda, Tanzania, Kenya, Democratic Republic of Congo and Burundi.

As illustrated in Table 6.2, with regard to mode of entry, 88 per cent of the interviewed foreign firms were established through greenfield projects.[11] In terms of ownership structure, three out of four of the interviewed foreign firms are majority foreign-owned firms.[12]

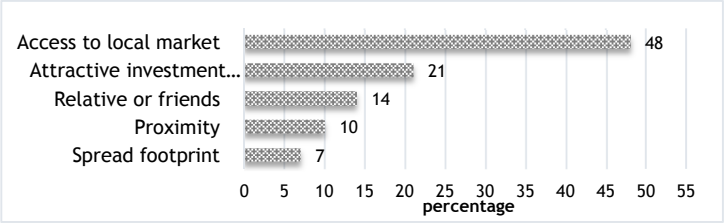
6.4 Findings and discussion

In this section, first we discuss other questions related to the inquiry: why or how did the surveyed foreign firms come to Uganda? We do this in order to answer related questions first and at the same time to provide a contextual background to the main research topic. Next, we move on to discuss our main research questions as presented in the introductory section.

6.4.1 Why do foreign firms come to Uganda?

Figure 6.7 presents a summary of the motives for the foreign firms interviewed to come to Uganda. The existing literature shows that access to the local market was the main motive to invest in Africa (e.g., Gu, 2009; Warmerdam and van Dijk, 2013a). Our study confirms this, indicating that market potential or access to the local market is the primary motive to come to Uganda for 48 per cent of the foreign firms interviewed. The second most frequently mentioned motive is the attractive investment climate (21 per cent). This is in line with Dollar et al. (2006) findings in Latin America and Asia that an attractive investment climate (the availability of better infrastructure, labour force, finance and institutions to encourage international investment) is an important factor.

Figure 6.7
Ranking of motivations to come to Uganda (%)



Source: Author's compilation based on the on-site interviews, 2015.

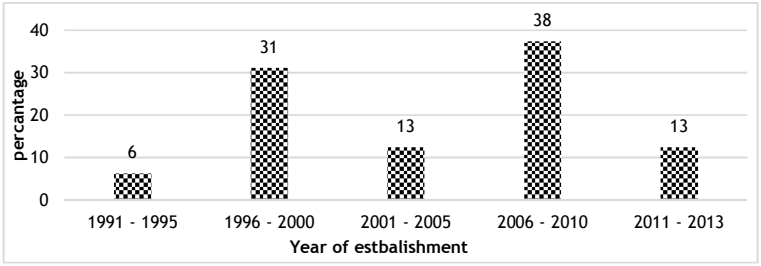
The third and fourth motives are relatives/friends (14 per cent) and geographical proximity (10 per cent), respectively. However, unlike suggestions in other surveys in Africa (e.g., Gu, 2009; Warmerdam and van Dijk, 2013a), few of the foreign-owned firms we interviewed come to

Uganda to spread out their footprint (7 per cent). For instance, to quote the interview with a foreign firm:

> *Our motivation to come to Uganda is to spread our footprint within the region, knowing very well that we have other multinationals outside the continent. [Anonymous, foreign firm, interview conducted on 30th April 2015]*

Figure 6.8 gives a summary of when the interviewed foreign firms in the survey first entered Uganda. About 38 per cent entered during the period 2006 – 2010, the main investments coming from Kenya, India and the UK. Another one-third came from Denmark, India, Kenya, UK and USA between the period 1996 and 2000. The most popular industries entering Uganda are the manufacture of chemicals and chemical products, fabricated metal products, machinery and equipment, and civil engineering.

Figure 6.8
Foreign firms by year of establishment



Source: Author's compilation based on the on-site interviews, 2015

As indicated above, a typical mode of entry for the foreign firms interviewed is greenfield investment. This mode of entry can provide a much better opportunity for local labour sourcing (Fortanier and Moons, 2011). The interview results show that approximately 75 per cent of the employees in the foreign firms are local. In general, the interviewed foreign firms involve local workers in a range of accounting activities, marketing, as technicians, for office maintenance, and for unskilled work. Foreign workers are usually engaged in production activities, as department heads and higher-level management. A few of the foreign firms interviewed indicated that they would like to have more foreign experts. However, due to labour regulations, particularly the issuing of work permits, they had no choice

but to employ locals who had relatively little experience and expertise. In particular, these firms responded that:

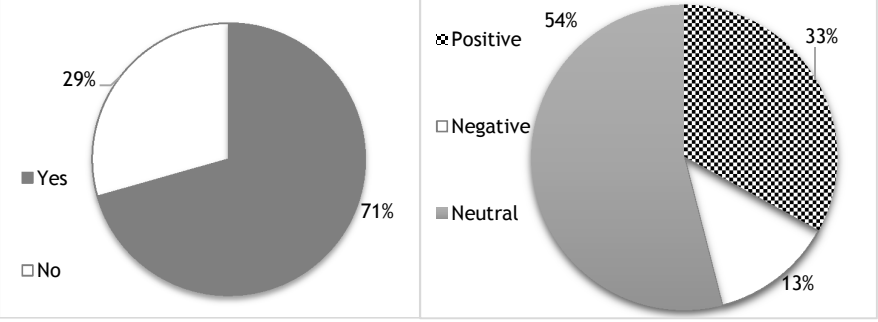
> *We could bring machines, equipment, and technologies, but if we are unable to or if it is difficult to get work permits for international experts to run and maintain foreign technologies there is often limited improvement in productivity or efficiency. [Mr. Abdulh Ali, Director, Ramco International, Interview conducted on 30th March 2015]*

One example of this can be seen in the chemical and chemical products sector. A firm had a digital or electronic measuring device equipped in one of their plants. When the machine developed a problem the firm was forced to remove the digital device and install a much more analogue or mechanical device to replace the computer controlled device as they could not get either a local expert or a work permit for a foreign expert.

6.4.2 FDI spillover effects and transmission channels

In this section, the main research question is investigated. First, we explore the nature and occurrence of spillover effects from foreign-owned firms in a given sector.

Figure 6.9
Existence of spillover effects from FDI



Source: Author's compilation based on the on-site interviews, 2015

Note: The chart on the left is based on interviews with 17 domestic firms, whereas the chart on the right is based on the 17, 18, and 19 responses on the imitation, labour mobility and competition channels, respectively. This is because one interviewed domestic firm benefited through both workers' skill acquisition and by the setting up of an own business after having worked for foreign affiliates. The other two firms believed they were affected with both market loss and by pressure to adopt or use existing resources efficiently.

As illustrated in Figure 6.9, 71 per cent of the interviewed domestic firms indicate that their productivity is affected either negatively or positively by the entry and operation of foreign firms. The breakdown of the overall spillover effects into the sign of the effects and transmission channels reveals that one-third (33 per cent) of the interviewed domestic firms claim that their productivity is affected positively by foreign counterparts. In several cases, increased competition due to the operation of the foreign firms was the most prominent positive effect. According to one operations manager from a domestic firm, in order to cope with the constant competitive pressure, the company has to endeavour to:

> *… identify methods, especially with the raw materials. We are forced at times to negotiate very aggressively with the suppliers of raw materials to get good prices. The other way is that we try to come up with a better quality product that is different to the one that the competition is offering. So we are forced to go to the drawing board and think of methods or ways we can make a product much better than the competition is offering. [Mr. Allan Kibirige, Operations Manager, Peacock Paints, interview conducted on 14th May 2015].*

Conversely, 13 per cent of the interviewed domestic firms believed that the entry and operation of foreign firms negatively affected their productivity. The most important impeding effect of foreign presence is the restriction on the local market share. To quote:

> *The presence of foreign firms exerts permanent competitive pressure …, they are making it hard for us to penetrate markets. They are beating us in quality and in price and we are getting a lower share of the market. [Anonymous, representing the Director of Desire Beauty Products, interview conducted on 22nd April 2015]*

However, slightly more than half (54 per cent) of the interviewed domestic firms believed that the foreign firms had no effect on their productivity. For instance:

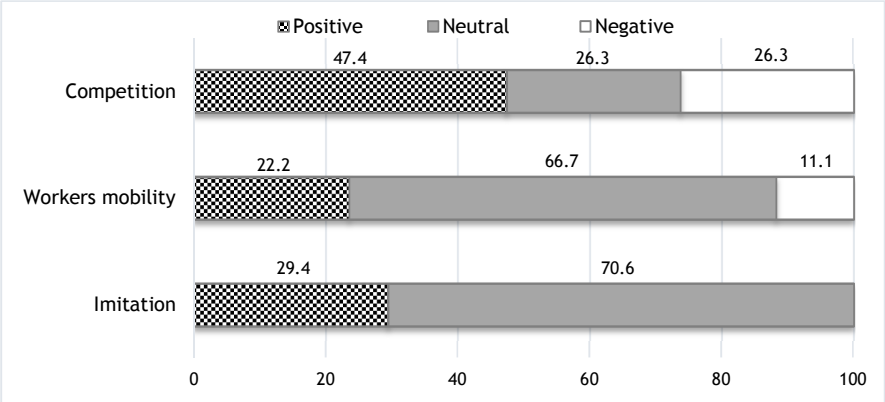
> *We do our own business regardless of what others do. This is an ocean where everyone has to fish. [Mr. Vin, Managing Director, Hotel Raviraj International, interview conducted on 12th May 2015]*

> *We don't feel the effect of the presence and operation of others. At Mansons we pride ourselves on our equipment, we pride ourselves on our unique knowledge base and industry experience. [Mr. Gurmeet, representing the Director of Financial Controller, Mansons Uganda, interview conducted on 8th April 2015]*

Next, we further looked inside the black box to explore how this spillover actually emerged. Figure 6.10 presents a closer investigation of the transmission channels and the sign of the effects. The most preeminent spillover channel is competition, as indicated by 14 responses from the interviewed domestic firms. With respect to this channel, 47 per cent believed that they were positively affected and 26 per cent experienced a negative effect. This channel shows that foreign counterparts exert competitive pressure and domestic firms try to find new methods or products or improve their quality in order to maintain their market position. The effects mainly occurred in the publishing and printing, chemical and chemical products, fabricated metal products, and construction industries. The constant competitive pressure in the domestic market between domestic and foreign firms in the sample was more common in these industries. This increased competition had various effects. For some interviewed domestic firms, the competition was seen as an incentive to adopt new technology. For instance:

> *The speed, the quality of printing and the simplicity of operations go with new technologies. The old machines are slow. For example, I was forced to buy the Speed Master machine [Figure A6.2] in this Nasser road [area], a very fast machine that prints 14,000 pages per hour. The one in the market was printing 10,000 per hour or slower. So because of competition, I was the first to introduce this high tech machine. [Mr. David Katende Managing Director, Intersoft Business Services, interview conducted on 9th April 2015]*

Figure 6.10
FDI spillover effects according to the sign and transmission channels (%)



Source: Author's compilation based on the on-site interviews, 2015.
Note: See Figure 6.9.

The increased competition was also found to force domestic firms to seek to improve the quality of their process and products. In this context, domestic firms endeavour to use their existing resources and technology more efficiently. The managing director of a domestic firm added that:

> *When we started, we had only five competitors in Uganda. Apparently, as I speak there are about 200 competitors. The competition has taught us to really provide quality. It wakes us up as we do not have monopoly power. So there is no issue of good will anymore, we have to really work for quality. [Anonymous, domestic firm, interview conducted on 29th April 2015]*

Table 6.3
Spillover effects from the entry and operation of foreign firms

FDI spillover effects	*Transmission channels*	*Yes*	*%*	*No*	*%*
Learning new processes and products	Imitation	5	29.4	12	70.6
Skill acquisition	Worker mobility	2	11.1		
Set up their own business		2	11.1		
Poaching/migration of worker		2	11.1	12	66.7
Market-losing: decrease domestic market share	Competition	5	26.3	5	26.3
Efficient use of existing resources or adopt new technologies		9	47.4		

Source: Author's compilation based on the on-site interviews, 2015.

Note: See Figure 6.9.

Table 6.3 provides summary of the diverse spillover effects from foreign firms. Consistent with the findings by Aitken and Harrison (1999), the competition channel also generates a 'market loss effect', i.e., the presence of foreign affiliates reduced the market share for slightly more than one-quarter of the interviewed domestic firms. This is also interpreted as a 'market reallocation effect', as foreign competitors take market share away from domestic firms. If this is a short-term effect, as discussed above domestic firms should be able to adjust their production process to improve productivity. If not, and if it is a long-term effect, domestic firms should either leave the sector or lose part of their market share to foreign competitors unless they are able to adjust their production process. The interviews confirm that some domestic firms face the negative competition effect as a result of the permanent reallocation of the market away

from them. For example, in support of this long-term market-losing effect, Miss Amanya Daphen, Senior Accountant at Sokoni Africa claimed that:

> *Foreign counterparts have drained us. Before, our target market was clear as not many companies were targeting the same niche, so we enjoyed the benefit of a certain market; I would not say monopoly but we were high. But, a number of companies come along doing the same business and targeting the same class. So, it [competition] has pushed us down by half, now the market is shared and so our sales are dropping. [Interview conducted on 21st May 2015]*

With regard to the imitation channel, learning about new products and processes provided by foreign firms in the host market is found to speed up access to and utilization of technologies by domestic counterparts. We see that 29 per cent of the interviewed domestic firms learned about the presence and practicality of new technologies from foreign counterparts (Table 6.3 and Figure 6.10). For instance, industries in the chemical and chemical products, communication services, and construction industries enhanced their productivity through this channel. Domestic firms in such industries are constantly trying to observe what their foreign counterparts are doing. Mr. Allan Kibirige, Operations Manager of Peacock Paints, added that:

> *… because foreign companies come with heterogeneous products, we are forced to adapt or do the same. For example, the instant colour dispenser technology [Figure A6.3]. Previously, if a customer wanted a specific paint product, we would have to go through a lot to have it ready for the customer, but now we learned and managed to get a machine [colour dispenser] to help us to do this in a short time. [Interview conducted on 14th May 2015]*

As argued by Barrios and Strobl (2002), the relevance of the imitation channel is expected to increase in line with the similarity in products produced by the domestic and foreign firms. In line with this, we attempted to understand how the interviewed foreign firms were constantly introducing new products and process technologies in order to maintain their technological superiority and how these were then successfully imitated by the domestic firms. To quote:

> *Since we are producing the same product, i.e., paint products, domestic firms imitate our techniques and learn from us. They buy our products from the market. They check the quality and the raw materials of our product to adapt and incorporate them into their*

methods of production. This affects us, so we have to innovate again or bring better technology. [Mr. Prashant Gupta, Country Manager, Basco Paints – a foreign-owned firm, interview conducted on 13th May 2015]

We also recognize that domestic firms might not be aware of the existence of a specific product or be certain about a process unless they see it in the market. Once they are aware of the availability of a given product or process, they sometimes seek to access and use it. In this regard, domestic firms in the sample showed the motivation to adopt and use a product or a process once foreign counterparts had successfully applied it. For instance, Daphen added that:

We had a recent issue with one of our products. We decided to go to the market and see what foreign counterparts are doing, so we actually fuelled the car and toured around the city just to have an idea of how well the others are doing. It was about finishing cake products, we had an issue with our cakes. The quality was ok but the finishing was not appealing. So we just decided to do a survey to imitate how others are actually doing it. [Miss Amanya Daphen, Senior Accountant of Sokoni Africa, interview conducted on 21st May 2015]

With regard to the worker mobility channel, the acquisition of workers having previously worked for foreign counterparts also provided a limited productivity effect. For instance, industries such as fabricated metal products, communications, constructions and hotel and restaurants provide some evidence of a productivity gain through the acquisition of tacit knowledge embedded in labour while working for foreign affiliates. Specifically, 11 per cent believed that they were positively affected via this channel. In this context, the interviewed domestic firms acquired experienced local workers that had worked for foreign affiliates. We also found that 11 per cent of the owners of domestic firms had experience in foreign firms in the host country.

Similar to the market-losing effect in the competition channel, the second most specific but limited negative spillover effect was the transfer of local workers from domestic firms to foreign rivals. This effect was observed in 11 per cent of the interviewed domestic firms. This particularly shows that foreign firms attract a limited number, but experienced workers away from their domestic counterparts by promising/offering better employment conditions. As a result of losing the best personnel to their foreign counterparts, in the short-term domestic firms are forced to cut their production. In the long-term, domestic firms were, however, able to

adjust their production process despite this short-term worker losing effect. For instance, one of the interviewed Ugandan textile firms reported:

> *They [foreign counterparts] have taken some of mine. Because, I trained my workers in England and Germany, and thus they took some of my workers. But, I have to adjust through training the other workers. [Mrs. Margaret Odaka, Managing Director, Peggy Garments, interview conducted on 14th April 2015]*

We have observed that foreign counterparts have more advanced technology. However, some domestic firms claim that exposure to the foreign firms' technology is highly restricted and difficult to access. One example is from the publishing and printing industry; a domestic firm experienced that access to most of the advanced technology of foreign firms is very restricted. As a result, domestic firms rarely acquire information about new technology at workshops, trade symposium, and exhibitions in foreign countries (e.g., China, Dubai, Denmark, Taiwan and Germany). A similar claim has been reported in expert interviews by Kamugasha and Ogwang who state that the imitation effect is limited by access, making difficult to learn about new products and process technologies from the foreign competitors. These expert interviewees also put forward a similar observation to the effect that the movement of workers is limited.

The results suggest that spillover effects are mainly stimulated through the competition channel. They also show that limited spillover effects occur through the other two channels – imitation and labour mobility. Furthermore, both negative and positive spillover effects occurred simultaneously in the domestic firms interviewed. In this regard, the FDI spillover occurrence and sign largely differ in terms of the channels through which they are expected to emerge. The next question to ask is what determines the nature of these spillover effects. In what follows, we investigate the main factors that explain the spillover effects observed in the domestic firms we interviewed.

6.4.3 What explains the FDI spillover effects?

In this section, we examine the main determinant factors behind the existence and sign of FDI spillover effects. To analyses this, as illustrated in Table 6.4, we organize these factors into absorptive capacity, technological gap, size and firm experience, exports and geographical location, in line with the recent studies by Crespo and Fontoura (2007), Jordaan (2012), and Merlevede et al. (2014).

Table 6.4
Driving factors of FDI spillover effects

Factors	*Yes*	*Yes and positive effect*	*%*	*No*	*No and absence or negative effect*	*%*
Absorptive capacity	19	10	55.6	35	27	75.0
Technological gap	23	11	61.1	31	14	66.7
Firm experience	30	11	61.1	24	17	52.8
Firm size	28	11	61.1	26	19	52.8
Exports	13	5	27.8	41	28	77.8
Geographical proximity	28	11	61.1	26	19	52.8

Source: Author's compilation based on the on-site interviews, 2015.

Note: See Figure 6.9. In total 54 responses were observed of which 18, 7, and 29 are positive, negative and neutral spillover effects, respectively. Technological gap represents a smaller gap between the two kinds of firms.

a) Absorptive Capacity

As shown in Table 6.4, approximately 56 per cent of the positive spillover effects from the entry and operation of foreign firms is derived from domestic firms that undertake formal employee training programmes (i.e., a measure of absorptive capacity). In contrast, 75 per cent of the absence or negative spillover effect is associated with domestic firms that had no formal training policy. A closer exploration of the interviews reveals that about three out of five domestic firms with a formal training programme benefited from the competition channel. A possible explanation could be that domestic firms which have absorptive capacity appear to cope and fiercely compete with foreign counterparts. The interviews with the foreign firms also provide evidence of the domestic firms' ability to understand and utilize external knowledge to compete with foreign competitors. For instance:

> *Each market has its own unique challenge. The one big challenge in Uganda is the height of competition, there is a load of local competition. This business environment is quite tough for us compared to when we first came into it. There was appetite to come and invest in a good market. Because, when we came into it, the players were very few. Now there are 10 times more players, so the marketability of our product is shrinking. [Anonymous, foreign firm, interview conducted on 30th April 2015]*

b) Technological Gap

The finding seems to support the occurrence of positive and significant spillovers only when there is a small technological difference between the

domestic firms and their foreign counterparts. As illustrated in Table 6.4, approximately two-thirds (61 per cent) of the spillover benefits can be explained by domestic firms with a moderate or small technological gap vis-à-vis foreign firms. In contrast, 67 per cent of the interviewed domestic firms believe there was either no effect or even a negative effect for firms with a large technological gap. In the latter case, in support of Kokko et al., (1996), it appears that these firms have possibly nothing to learn from foreign firms as their technological capability is so weak that foreign technologies cannot be used.

c) Firm Experience and Size

The result indicates those domestic firms with at least the median years of experience (measured in terms of age since establishment) and size (measured in terms of number of employees) received 61 per cent of the positive spillover effects in the sample. In contrast, slightly more than half of the absence of or negative effects experienced by domestic firms occurred in firms with less than the median firm age. Aitken and Harrison (1999), using panel data on Venezuelan industries, find that significant negative spillovers are concentrated in small firms which cannot compete effectively with foreign counterparts. In line with this, a further look at the interviews reveals that mature and larger firms are not only apt to absorb external technology, but are also able to counter competition from foreign firms in the domestic market. For instance, to quote part of an interview with a foreign-owned firm:

> *Right now, the competition has gone to almost 100 per cent compared to when the company started. At the time, very few Ugandans were doing this kind of work … but as time moved on [domestic] firms become larger and became more experienced. [Mr. Bruhad Patel, Director, Polad Uganda, interview conducted on 14th May 2015]*

d) Exports

Our findings suggest that 28 per cent of the positive spillover benefits are associated with domestic firms which also operate in foreign markets. Conversely, 78 per cent of the absence of or negative effect of spillovers is associated with domestic firms operating only in the local market. A further look at the interviews indicates that about half of the interviewed exporting domestic firms believed that foreign firms had no effect on their productivity at all. We therefore argue that the exporting activity of the

interviewed domestic firms is unlikely to enhance the potential for spillover effects.

e) Geographical Proximity

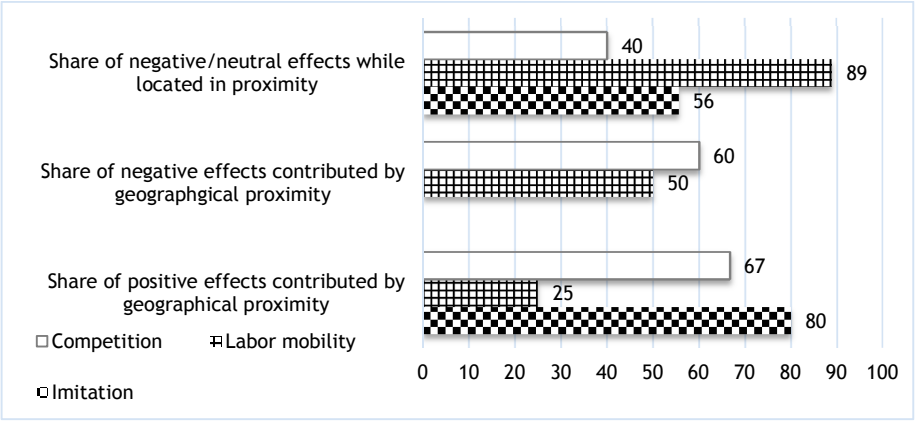
Regarding geographical proximity, interviewed domestic firms considered the presence of foreign firms up to 5 km away from their establishment and we use this to explore the geographical dimension of spillover effects. Overall, our interviews indicate that 61 per cent of the positive spillovers were experienced by domestic firms located near foreign rivals (i.e., within a distance of 5 km). In contrast, slightly more than half (53 per cent) of the absence of or negative effect of spillovers was experienced by those interviewed firms which do not have foreign rivals in their neighbourhood.

More specifically, Figure 6.11 summarizes geographical proximity and the workings of the channels. About 80 per cent of the interviewed domestic firms that learn via the imitation channel do so when they are located in close proximity to foreign firms. In contrast, only 25 per cent of the spillover gains from labour mobility was due to local firms which were located near foreign rivals. This suggests that the labour mobility channel is unlikely to enhance spillover benefits. We further explored the negative or neutral effects on firms located close to foreign rivals. In this regard, for mobility of labour channel, we find that 89 per cent of the absence of or negative effect was experienced by domestic firms operating at a close distance to foreign firms. This does not support the argument presented by Girma (2005) and Jordaan (2005). In support of the limited benefit through the worker mobility channel, Kamugasha added that the Ugandan labour force is very static as the labour market in terms of the mobility of persons in a sector is very weak.

Our results from the Ugandan firms we interviewed appear to disagree with the theoretical predictions posited by Jordaan (2005). First, the lowest share of the absence of or negative effect of spillovers (40 per cent) is found through the competition channel when foreign and domestic firms are in close proximity to each other. Second, the worker mobility channel appears to enhance limited positive spillover effects (25 per cent), but is also likely to enhance significant negative effects (50 per cent). Third, the highest share of the absence of or negative effect of spillovers (89 per cent) is observed in the worker mobility channel when both foreign and domes-

tic firms are located in close proximity to each other. Therefore, our fieldwork seems to suggest that the workings of the competition effect are likely to be effective when geographical proximity is considered. Furthermore, the labour mobility channel is just as likely to generate negative effects as positive effects, so that the effects of this channel are not as clear-cut as argued by Jordaan (2005).

Figure 6.11
Transmission channels according to geographical proximity



Source: Author's compilation based on the on-site interviews, 2015.

6.4.4 Implications for technological versus pecuniary spillovers

This section relates the outlined spillover channels to the nature of technological and pecuniary spillovers as discussed in Chapter 2. The results described in this chapter suggest that large spillover effects emerge through the competition effect. In the short-term, there is a business-losing effect in which the presence of foreign firms diverts business away from domestic firms. However, in the medium to long-term, competition in the local market forces the domestic firms to improve their competitiveness through either the efficient use of existing resources or by adopting better technologies. It appears that the interviewed local firms that possess absorptive capacity, have a greater technological capacity, or operate close to foreign rivals generally encounter a short-term market loss.

Local firms that lack competitiveness or are unable to adjust their production process experience a negative competition effect. This initial market loss effect transforms into a long-term negative competition effect as foreign counterparts permanently reallocate markets away from domestic firms. As illustrated in Chapter 2, the gains and losses from the competition channel are interpreted as pecuniary spillover effects. Although some of the interviewed firms are affected by negative pecuniary spillover effects, the majority of the domestic firms in the sample appeared to benefit from the nature of long-term pecuniary spillover effects. In this context, increased competition in the local market can be seen as an incentive to local firms to use existing resources or new technologies more efficiently, creating pecuniary spillover gains. For foreign firms, this stronger competition, as shown in the model by Wang and Blomström (1992), can be seen as exerting pressure to transfer technology that is more advanced in order to maintain their market share, creating the potential for pecuniary and technological spillovers. In such cases, the increased level of competition in the local market propels the competition-determined spillovers.

The increased level of competition also led foreign firms to protect their technological superiority in a more active way, as illustrated, for instance, in the model by Glass and Saggi (2002). The evidence indicates that more than two of the three domestic firms did not appear to generate spillover benefits through either the labour mobility or the imitation channels. With regard to the former, the wage differentials between foreign and local firms play an important role in restricting the occurrence of technological spillovers. It is observed that, in developing countries like Uganda, foreign firms usually pay higher wages than domestic firms (for a similar observation, see Aitken et al., 1996; Lipsey and Sjöholm, 2004). To quote:

> *I have not seen someone leave due to an interest to work for a different [local] company. This may explain why our employees are comfortable with the company, having so much job security and payment, ensuring people work here for long time. [Mrs. Morin, Executive Secretary, Cooper Motor Corporation – a foreign-owned firm, interview conducted on 8th April 2015]*

Similar arguments put forward in the expert interviews. For example, Kamugasha reveals that:

> *With technical people, the production crews, there is not much movement: for instance, if I work in production engineering in a coca cola company who can even pay me. [Dr Dick*

Kamugasha, Director of Technology Development and Transfer, UIRI, interview conducted on 28th May 2015]

The existence of such a wage gap makes it difficult for domestic firms to attract experienced local workers from their foreign rivals. This restricts the workings of the worker mobility channel. This is consistent with the theoretical prediction made by Fosfuri et al. (2001) and Glass and Saggi (2002). However, it is important to note that the potential for technological spillovers switches to pecuniary spillovers. This is because this restriction (i.e., protecting local workers from switching to domestic firms) on worker mobility imposed by foreign firms has to offer local workers better employment condition (e.g., in terms of higher wages), indicating the occurrence of pecuniary spillovers. In addition to the pecuniary spillovers obtained in this way, local workers are also attracted away from domestic firms towards foreign counterparts by the existence of wage differentials. This further adds to the nature of pecuniary spillovers.

With regard to the imitation channel, increased competition in the local market restricts exposure to advanced foreign technology. In this context, lower technological spillover effects emerge mainly because access to foreign technologies is likely to be protected. As can be inferred from the model by Das (1987), learning from watching by local firms may lead foreign affiliates to continue the transfer of more advanced technologies from the home country. The results from our interviews show that increased local competition forces foreign firms to protect themselves from leakage of their advanced technologies, restricting learning from watching.[13]

Because of the high level of local competition that emerges from the competition-determined spillovers, foreign firms are forced to use more advanced technology and at the same time to protect themselves from leakages. The latter impose costs on the workings of the imitation and worker mobility channels. Consequently, the effectiveness of the worker mobility and imitation channels are deterred. However, both short-term and long-term limited technological spillover effects emerge via imitation as opposed to the movement of workers[14]. The implication is that the FDI spillover effects on the interviewed domestic firms emerged mainly via long-term pecuniary spillover effects, while technological spillover effects, be they short or long-term, were limited. In this respect, the occurrence of spillovers largely depends on the channel by which they are expected to emerge. Hence, we conclude that a more complete picture of spillover

effects is gained when all transmission channels are taken into account simultaneously.

6.5 Conclusions

Since the 1980s, a number of developing countries have started to set policies to promote FDI inflow. In Uganda, starting 1991 with the establishment of the UIA, FDI inflow has shown a gradual increase. After 2004, FDI inflow exhibited a significant and continuous expansion. FDI was worth only US$1 million in 1991, had risen to US$0.2 billion in 2004, and reached an all-time high of US$1.205 billion in 2012. After a slight decline in 2013, FDI inflow reached a second historical level of US$1.147 billion in 2014.

One motivation behind the inflow of FDI is the spillover benefits for domestic firms. Theoretically, FDI is assumed to generate spillover effects through three main channels, namely, imitation, labour mobility and competition, an argument largely disregarded by the existing econometric analyses. Furthermore, we observed that the scant empirical analysis of the econometric approach does not allow for a more complete and detailed description of the channels. Accordingly, instead of investigating the FDI spillover question using econometric analysis alone, this study moves the research topic forward by using firm-level qualitative data from a number of on-site semi-structured interviews with the managers of foreign and domestic firms in Uganda. To the best of our knowledge, this approach is thus far unexplored.

Using the qualitative data obtained, we showed that the existence of spillover effects mainly depends on the channels by which they are expected to occur. We conclude that a more complete picture of the spillover effects is reached when the channels are considered simultaneously. For instance, we observed the simultaneous occurrence of both positive and negative spillover effects in the domestic firms we interviewed. More specifically, our results suggest that, in our sample, FDI spillover effects are mainly enhanced via the competition channel and that this may lead foreign firms to transfer advanced technology as well as to protect their technological advantage in a more active way. Furthermore, spillover benefits through both the worker mobility and the imitation channels are less prevalent mainly due to the results of the competition-determined spillovers. The learning from watching hypothesis described by Das (1987), appeared

unlikely to be effective in our sample. Wang and Blomström (1992) also emphasize that the higher the level of competition a foreign firm faces in the host market, the more advanced technology it has to transfer to maintain its competitive advantage, indicating a larger potential for spillover benefits. In our sample, as a result of this kind of increased level of competition, local firms were unable to switch potential spillover effects into actual benefits, in particular via imitation and movement of labour effects. The entry and operation of foreign rivals increases local competition, which forms an incentive for local firms to be more productive and efficient. This increases the competition capacity of the interviewed local firms which in turn causes foreign firms to protect themselves from technological leakage. This is in line with Glass and Saggi (2002) who stress that the higher the level of competition a foreign firm faces, the more actively it will protect its technological superiority.

We have also shown that the occurrence of spillovers mainly depends on absorptive capacity, technological gap, and geographical proximity. Domestic firms with a higher absorptive capacity appear to internalize spillovers more efficiently. This occurs mainly through the competition channel as such firms invest in the quality of their labour force in order to cope and fiercely compete with foreign rivals. Domestic firms with a small technological gap vis-à-vis foreign firms seem to have sufficient capacity to gain from FDI presence. Spillover benefits also appear to be internalized better through the imitation and competition channels when domestic and foreign firms are geographically close.

An important inference in our approach in this chapter is that future research should move this line of research forward using fieldwork interviews and observations. It is also relevant to incorporate crowding out effects, as we could not interview firms that had left the market due to strong competition associated with the presence foreign firms prior to our fieldwork. Future research should also incorporate FDI heterogeneity as the effect may vary in relation to foreign investors' characteristics.

Notes

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[2] Note that the data is planned investment collected by the UIA during the licensing or business registration of the projects.

[3] Later revised as Laws of Uganda edition 2000.

[4] For instance, tax holidays, import and export duty exemption, investment capital allowance, full repatriation of profits and 100 per cent foreign ownership.

[5] Deputy Director of Investment Promotion Division, UIA, interview conducted on 3rd July 2015.

[6] Several international investment promotions and workshops organized to explain and enhance the opportunities provided in Uganda that include a Ugandan investment summits and diaspora summit in USA, the UK, Thailand, India, South Africa, … etc.

[7] In 2013, 48 countries invested in Uganda. This grew over time, with FDI coming from, on average, only 16 countries in the period 1991-95, 22 countries in the period 1996-2000, 28 countries in the period 2001-05, and 40 countries in the period 2006-10.

[8] For instance, Rasiah (2009) suggested a combination of slow transition in Tanzania and economic failure in Kenya, whereas Riddervold (2011) indicated political upheavals in Kenya.

[9] Recall that, even though the first episode of the crisis affected FDI inflow into developed countries immediately in 2008, it is the second episode of the crisis that started to bite FDI inflow into developing countries like Uganda (Bhattacharya and Dasgupta, 2012).

[10] Director of Technology Development and Transfer at the Uganda Industrial Research Institute (UIRI), interview conducted on 28th May 2015.

[11] Spillover from FDI can also be influenced by the FDI mode of entry. FDI through greenfield investment is more likely to create spillovers as the starting point is the technology in the FDI home country.

[12] This is also important for potential spillovers, as minority foreign-owned firms appear to reduce the scope for spillovers (Chapter 5 of this thesis). The incentives to transfer new technology from the FDI home country to its subsidiary in the host country reduces in relation to the degree of foreign ownership (Crespo and Fontoura, 2007). In this case, minority ownership is assumed to reduce control over the management of firms (Merlevede et al., 2014; Müller and Schnitzer, 2006).

[13] As argued by Kamugasha and Ogwang, in this case, the doors of the foreign firms are closed. Furthermore, the interaction of the local population is mainly restricted to the peripheral processes, the soft side of the operation.

[14] Here, an increased level of local competition also may result in long-term pecuniary spillovers through the labour mobility channel when local workers are attracted by foreign firms or are discouraged from switching employer by being offered better employment conditions, e.g., higher wages than workers in the domestic pool.

7 Summary and conclusions

7.1 Introduction

What does FDI do to intra-industry productivity spillovers? Policy-makers appear to be in broad agreement on the side benefits of FDI's potential for spillovers as a valuable input to economic growth and development. This pro-FDI view has been routinely supported with subsidies and a range of incentives as a justification for spillover potential. Did the benefits materialize? Given the continuous and increasing policy priority being placed on promoting FDI, academics continue in a debate of contradictions. What can explain academics' controversial empirical findings on actual spillover benefits from FDI?

This thesis investigates the presence of intra-industry productivity spillover effects from FDI in developing countries. In order to pursue this objective, the thesis set out to answer the following seven research questions:

i. Does the FDI spillovers literature suffer from publication bias, and if so, to what extent?

ii. What is the genuine underlying size, sign and significance of the intra-industry spillover effect reported in empirical literature?

iii. What explains the reason behind the observed heterogeneity of the findings reported in the empirical studies?

iv. Does FDI generate intra-industry spillovers for SSA host firms, and if so, with respect to which transmission channels are these gains actually received?

v. How and to what extent do absorptive capacity and the technological level of host country firms influence the workings of the intra-industry spillovers transmission channels?

vi. Does geographical proximity between foreign and domestic firms affect the workings of the transmission channels?

vii. Do the spillover effect transmission channels vary between majority foreign-owned firms and minority foreign-owned firms?

The first three questions are related to the existence of conflicting and contradictory findings reported in the primary studies of intra-industry productivity spillovers from FDI. Since the pioneering research by Blomström and Persson (1983) for developing countries, the topic has produced much empirical evidence, but with inconsistent results that continue to be disputed in the literature. Empirical researchers and policy-makers seek to answer the central question of whether promoting FDI for productivity benefits is an effective channel by which advanced foreign knowledge and technology can be diffused to host countries. This question is relevant because facilitating inward FDI involves a costly public programme, as it needs attractive policy incentives and an attractive business environment. To address this central question, the thesis designed a comprehensive meta-analytical approach to investigate and identify the existence of a genuine underlying spillover effect that is robust to potential publication bias, endogeneity problems and omitted variable bias.

The other four questions are aimed at exploring the empirically under-researched but theoretically well-established transmission channels of intra-industry spillovers. The research motivation is to contribute to the question of whether the presence of FDI generates spillover benefits for host countries according to the channels by which they are hypothesized to take place.

Empirically, the literature follows an analytical approach to the intra-industry spillover effects from FDI in a framework of a production function. The productivity levels of domestic firms are regressed on a number of covariates that incorporate a single spillover variable measuring the extent of foreign presence. This literature simply considers whether there has been any spillover effect. In this context, the literature has failed to distinguish spillover effects that can be determined by the share of foreign presence from the competition-related interaction and the movement of workers between foreign and domestic firms. Too often, the existence, sign and size of such a spillover investigation overlooks the fact that spillovers vary according to the mechanism under which they are actually

transmitted. In this regard, how this intra-industry spillover emerges is often treated as a black box, indicating that the existing approach is not complete. Against this background, the empirical strategy of this thesis recognizes that FDI spillover effects should not be interpreted based only on the single foreign share presence as is common in the literature. Rather, as developed in Chapter 2, the analytical approach is designed to try to provide a better description of such spillover effects according to the transmission channels by which they are hypothesized to occur.

7.2 Main empirical findings

Chapters 3 and 4 present the findings from 1,450 estimates using 69 primary studies. Contrary to recent meta-analyses in this field, Chapter 3 clearly uncovers that publication bias is a problem here. It also uncovers the extent and source of the bias. The bias ranges from 0.505 to 1.335, implying that the average effect size across the reported spillover estimates is larger than the genuine underlying spillover effect. In other words, reported spillover estimates are significantly overstated. The empirical studies in this field have not been influenced by publication selection pressure from journal editors and reviewers. The analysis also suggests that publication bias in this literature is quite recent.

Chapter 4 first provides the weighted average spillover effect using sample size as weights and finds a positive and significant empirical effect to a magnitude of 0.16. In the presence of the meaningful publication bias identified in Chapter 3 and Demena (2015), this weighted average spillover effect cannot be trusted. After taking the publication bias and misspecification of the primary studies into account, unlike Iršová and Havránek (2013) who find that intra-sector spillovers are statistically indistinguishable from zero, the underlying genuine spillover effect established by this study is economically important to a size of 0.09. Against the bivariate PET, the authenticity of this empirical effect becomes evident once we move to the multivariate approach, indicating the importance of carefully exploring moderator variables that can potentially help to explain the nature of disagreement in the disseminated results. Furthermore, in Chapter 4, we revisited the issue of publication bias and found that best practice approach is not the cause of the publication bias reported in Chapter 3.

Though we identify several sources of potential heterogeneity, we use the GETS modelling approach to choose the moderator variables that appear to be important in understanding the heterogeneity in the reported spillover estimates. In support of the removal of 15 moderator variables that appear not to be important, we have systematically avoided the potential problem of multicollinearity and loss of degrees of freedom, and also mitigate jointly insignificant moderators in explaining the heterogeneity. Accordingly, the size of the spillover effects and their sign depends systematically on two major sources of heterogeneity: specification characteristics of the primary studies and publication bias.

An important finding in Chapters 3 and 4 is that the systematic selection of primary studies may lead to bias in the meta-analysis. Meta-analysts often involve personal judgement in identifying the primary studies. In our meta-analyses, we have shown that the selection of studies has an impact on the findings and eventually may lead to misleading conclusions. As a result, reporting on the meta-analyses results and their relevance can be jeopardized. In this study, we bypass such personal judgement and thus avoid the bias by amassing all available and accessible studies for developing countries, a research design thus far not explored. We also demonstrate the application of the MAER-Net reporting guidelines in order to improve and increase the transparency and quality of the meta-analysis.

After analyzing the existing primary empirical studies, in Chapters 5 and 6 we demonstrate a fuller and more nuanced picture of spillover effects by investigating the empirically under-researched but theoretically well-established transmission channels of intra-industry spillover. In Chapter 5, using the full sample, productivity gains from FDI mainly emerge through the imitation channel, but also through the labour mobility channel although the benefit is much smaller than the imitation channel. The competition channel, on the other hand, enhances the existence of negative pecuniary spillovers. This means that the presence of FDI transfers part of the domestic market share towards foreign counterparts, creating market-losing effects. Overall, using the imitation channel, domestic firms largely manage to understand and internalize the opportunity for process and product innovation technology available from FDI.

An interesting finding is related to whether spillover effects and their relative importance still exist once we incorporate firm-level heterogeneity. The findings support the estimated effects of the full sample in showing that there are positive spillovers, but the type and nature of the effects

vary in terms of the technological levels and absorptive capacity of local firms. The competition-related spillovers confirm that the productivity of domestic firm seems to benefit when the local firms possess higher absorptive capability, enabling them to decode and understand foreign firm-specific technology more efficiently. This is in line with the theory that absorption is not purely about imitation (Cohen and Levinthal, 1990; Narula and Marine, 2003). Instead, firms that have invested significantly in their absorptive capacity are able to internalize the FDI spillover gains more efficiently. Put differently, firms with low absorptive capacity are able to benefit only through the implementation of foreign technology, whereas firms with high absorptive capacity benefit both from the development of existing or new technology as well as from the implementation of foreign technology.

For local firms with a small technological gap, it appears that the workings of the competition channel are hampered by a high level of direct competition between domestic and foreign firms. Firms with a large technological gap boost their productivity only through the labour mobility channel. As indicated by Mody (1989), this channel can help this group of firms by providing some personnel to better understand and implement foreign technologies (see also Hamida, 2013). Fosfuri et al. (2001) observe that spillovers through the movement of workers depend on the nature of technology and how this can easily be transferred. It appears, in line with labour economics literature (e.g., Becker, 1964) and labour mobility literature (e.g., Fosfuri et al., 2001), that firms with a low technological level benefit from the labour mobility channel as such firms require more general on-the-job training as opposed to firm-specific training. In contrast, for this group of firms, as the empirical findings of the imitation and competition channels demonstrate, the productivity gap between foreign and domestic firms is the main reason for negative spillover effects.

The evidence also supports the theoretical formulation that geographical proximity or concentration facilitates the workings of the transmission channels mainly through imitation-determined spillovers. The labour mobility channel generates positive and significant effects, but not different from estimations that consider firms altogether, i.e., irrespective of the geographical proximity. Considering this scenario, unlike the theoretical predictions by Jordaan (2005) and Girma (2005), the worker mobility-determined spillover is not found to enhance productivity gains when the two types of firms are located in close proximity to each other.

Moreover, the advanced technology of majority foreign-owned firms mainly drives the knowledge spillover effects (imitation- and worker mobility-determined spillovers), whereas minority foreign-owned firms seem to be unwilling or unable to bring their advanced technologies to host countries, but enhance the allocative efficiency spillover effects (competition-determined spillovers). Furthermore, we find that the magnitude of the imitation effect is reduced and the gains from the movement of workers vanish altogether with exports. Analysis of the non-linear spillover effects points to declining (vanishing) spillover benefits after an increase in FDI penetration goes past a certain point. It seems that foreign firms are more likely to protect their advanced technology in a more active way after the share of foreign presence moves beyond certain point. In the theoretical model by Das (1987), the existence of learning from watching by the local firms may encourage foreign affiliates to transfer more superior technology. A similar model by Wang and Blomström (1992), suggests that where there is a high level of local competition, more advanced technology has to be transferred by foreign firms to keep their competitive advantage, thus enhancing the potential for spillover gains. However, in our sample and consistent with Glass and Saggi (2002), after the foreign share had exceeded the inflection point (i.e., 59 per cent), we get a situation in which a foreign affiliate faced with a higher level of competition, will more actively protect its technological superiority.

Nevertheless, we found that the econometric approach alone does not provide a good description of FDI-related spillover effects. For instance, we found that it is difficult to ascertain whether the effect is due to technological spillovers when domestic firms hire local workers who previously worked for foreign firms, or to pecuniary spillovers when foreign firms attract skilled local workers. The findings in Chapter 6 complement and add to the empirical evidence provided in Chapter 5. The main findings in Chapter 6 show that long-term pecuniary spillover effects found in the interviewed Ugandan firms were predominantly stimulated via the competition channel, whereas both the short-term and long-term technological spillover effects occurred via imitation and movement of workers channels. These channels, however, were not only less prevalent but also appeared to be constrained by competition-determined spillovers, somewhat consistent with the non-linear spillover effects analysis in Chapter 5.

The evidence further shows that the competition channel appeared to have had a positive influence on just over two-thirds of the interviewed

Ugandan firms when geographical proximity was considered. In this sense, the spatial dimension appears to influence the competition effects between domestic firms and foreign rivals. In this regard, the on-site firm-level interviews appear to disagree with existing theoretical predictions. In other words, when geographical proximity is considered, our on-site interviews indicate that the workings of the competition effect are likely to be the more effective. Furthermore, the Ugandan firms we interviewed suggested that the labour mobility channel enhances the occurrence of both negative and positive effects, so these are not likely to be as clear-cut as is assumed by existing theories (e.g., Girma, 2005; Jordaan, 2005). Finally, the evidence in Chapter 6 finds that the empirical investigation of FDI-related spillover effects is a challenging research topic as both negative and positive spillover effects emerged simultaneously in the interviewed domestic firms.

7.3 Policy implications

The findings of this thesis illustrate that it is important to take factors that generate and (help to) internalize spillovers into account when designing FDI policies. Attracting FDI is not sufficient for spillovers. Developing countries could provide support to local firms aimed at improving local capacity and identifying modern technologies. Based on the findings of this thesis, we derive six messages that are relevant for policy-makers. The focus of the policy messages is on the group of SSA economies utilizing a unique firm-level dataset, but the messages can also be relevant for developing countries in general. In this regard, the policy implications from each chapter can be referred to as a whole for all developing countries and specifically for a number of sub-Saharan economies. However, we also note that our findings do not necessarily represent all developing countries (or all SSA countries), as this research topic has not yet been studied for a sufficiently large group of these countries.

Policy Message 1: *The underlying genuine intra-industry productivity spillover effect is positive and statistically significant, but substantially smaller than reported for developing countries in general.*

Policy-makers seek answers to questions about which policies and practices to promote and employ. Indeed, Gibbs (2003:153) observes that policy-makers 'should be able to rely on reviewers to isolate the best evidence

for them and to distil it for its essence to guide practice decision-making'. In this regard, policy-makers require systematic research syntheses in order to support and employ informed decisions of the expected outcomes of a given policy programme. This thesis clearly uncovers that publication bias is a problem in this field and thus potentially distorts policy inferences in developing countries. In other words, the literature appears to report a much larger empirical spillover effect than the genuine underlying effect actually is. Hence, an investigation of publication bias is important before firm policy implications can be prescribed based on the reported estimates. The policy implication is that the literature supports the theories which suggest that the intra-industry spillover effects from FDI lead to positive productivity gains for developing host countries, but that they largely overstate the actual effect. Attempts to identify, combine, and synthesize reported primary empirical findings should also be used to identify existing research lacunae in order to better guide future primary research and in turn inform policy-makers thus enabling them to make better policy and practice decisions.

Policy Message 2: *The channel by which the spillover occurs matters for SSA.*

The empirical investigation that emerged from the group of sub-Saharan economies demonstrates the relevance of the spillover channels. That is, given the nature of the three spillover transmission channels, it is insufficient to interpret aggregate spillover effects, as the significance, sign and size of the intra-industry spillover effects vary in terms of how they are expected to occur. Not only from the academic point of view, but also for policy purposes, the findings of this thesis are interesting and potentially significant, but the extant literature largely neglect to guide us towards the channels through which spillover effects actually emerge.

Often, policy-makers cite knowledge and technology spillovers to host countries as an important benefit associated with FDI (see also Demena and van Bergeijk, 2017b). Yet the theoretical intra-industry productivity spillover benefits do not emerge automatically, thus implying that simply facilitating FDI may not ensure that host countries gain productivity spillovers. Rather, empirical research needs to emphasize a better description and understanding of the channels by which FDI can deliver positive spillover effects. In general, this thesis found that SSA firms' productivity tends to benefit mainly through the imitation channel, but sees limited

benefit from the labour mobility channel. The latter is not unanticipated as the labour mobility channel was mainly stimulated in developed countries, as demonstrated in the third strand of spillovers literature (e.g., Glass and Saggi, 2002). Furthermore, the empirical findings suggest that SSA firms appear to face losses in their market share due to increased local competition.

A somewhat similar pattern was observed in the Ugandan firms that were studied. The findings seem to indicate that these Ugandan firms appeared to internalize spillover benefits through the competition channel, implying the presence of long-term pecuniary spillovers. Although the worker mobility and imitation channels are less prevalent and mainly associated with the presence of competition-determined spillovers, the benefit is greater from the imitation effects than from the labour mobility effects. It also appeared that the Ugandan firms incurred a loss of market share and local workers to foreign firms. This analysis also emphasizes that access to superior foreign technology is highly restricted. A policy agenda to facilitate foreign firms should not only determine the number of job opportunities for local workers, but also specify the extent of their involvement across the entire production line as this process appears to be an important ingredient of the policy package.

Policy Message 3: *The technological gap is relevant in SSA.*

The technological gap hypothesis is one of the main foci of policy research of this topic. For instance, recently, the Member States of the third international conference on financing for development identified policy measures aiming at closing the technological gap of host countries through strengthening FDI-related spillovers (United Nations, 2015b). In this regard, the empirical finding that emerged from SSA firms disproves the original theoretical formulation proposed by Veblen (1915) and latter followed by Gerschenkron (1962), Findlay (1978), Abramovitz (1986) and Wang and Blomström (1992) that suggest that technological effects will takes place faster when there is a greater relative technological gap between domestic and foreign firms: the so-called catch-up hypothesis. This was the basic theoretical assumption on which a number of governments in developing countries based their policies for attracting FDI in high tech industries (Fan, 2002).

Conversely, what this thesis suggests is the need for SSA countries to initiate policy measures aimed at promoting and facilitating foreign firms with a relatively small or moderate technological gap vis-à-vis their host firms in a given industry, supporting the theoretical assumption of Lapan and Bardhan (1973) among others. This is potentially important for the imitation-determined spillovers channel in particular. In line with this, the incentive for host firms with a relatively high technological level to access superior, licensed FDI technology can provide a significant source of potential spillovers. In support of this, recently Farole and Winkler (2014b) argued that host country government incentives to license foreign technology are effective polices in promoting local technological levels in a number of developing countries. However, if a policy measure is intended to induce knowledge spillover effects through the mobility of workers, our policy inference supports the original theoretical formulation of the technological gap.

Policy Message 4: *Building and upgrading the absorption capabilities enables SSA firms to internalize spillover gains.*

The empirical findings in this thesis also suggest that increasing local firms' absorptive capacity to enable them to internalize the potential for spillovers from advanced foreign technology requires investments in training and learning efforts. Enhancing the absorptive capacity of domestic firms and the quality of the local labour force through education and training (i.e., upgrading knowledge and skills) can be established as an important component of promoting spillover effects. In particular, policies can be aimed at helping local workers and host country firms to access capacity building opportunities (e.g., providing information related to FDI technological characteristics) and reducing the relative local managerial and technical skills gap vis-à-vis FDI in a given industry. This potentially enhances the workings of imitation-determined spillovers and competition-determined spillovers.

Policy Message 5: *Proximity matters for spillovers in SSA.*

The geographical proximity or concentration analyses demonstrate that the occurrence and size of productivity spillovers are enhanced by SSA firms located in close proximity to each other or concentrated in the same

region. When attracting FDI, governments should consider establishing foreign firms to closer to local firms in the same industry. This is particularly relevant for imitation and somewhat relevant for competition. In this respect, incentives are needed to not only attract FDI, but also to encourage FDI to be established near to domestic counterparts and into regions where foreign firms are less established. With regard to the labour mobility channel, it might appear reasonable to assume that for domestic firms it is much easier to identify and attract workers who worked for or were trained by foreign counterparts if such workers are in the same region or available close by in order to absorb foreign technology. However, unlike the consensus in the literature related to this channel, this thesis demonstrates little or limited attention to productivity gains through movement of workers when both types of firms located close together.

Policy Message 6: *Spillovers in SSA mainly occur from majority foreign-owned firms.*

The majority- versus minority foreign-owned analysis supports the policy agenda aimed at encouraging and facilitating FDI with total and majority ownership control (i.e., for knowledge spillovers). This is because advanced and more technology transfer from abroad is likely to take place when a parent company has tighter control of its subsidiary in a host country. The empirical evidence demonstrates that the advanced technology of majority foreign-owned firms mainly stimulates the FDI benefits in terms of imitation and worker mobility related spillovers. Conversely, minority foreign-owned firms seem to be unwilling or unable to bring their advanced technologies to the host countries, but importantly they stimulate the workings of the competition channel. In other words, only majority foreign-owned firms within the host economies deliver the entirety of the observed knowledge spillover effects from advanced foreign technology but impair the workings of the competition effect. This can imply the need for government policies which aim to encourage FDI with total and majority ownership control for the transfer of knowledge about superior foreign technology, and minority foreign ownership to enhance competition between foreign and domestic firms.

7.4 Future research

With the main empirical findings and policy implications of this thesis, this section sets out the limitations of the thesis and discusses possible future research. Although the limitations of the thesis themselves suggest some future research possibilities, we also present a broader scope of the research topic for a more and further comprehensive analysis of spillover effects from FDI. In particular, it is important to recognize from the start that a future analytical research agenda could emphasize a broader framework of how spillover effects actually emerge rather than a narrow approach focusing on only whether or not FDI generates spillover effects. We suggest the following for further research.

The empirical inquiry needs to expand to cover more developing countries.

Given that this research topic is limited to 31 countries (in itself a lively research agenda), empirical efforts should expand and pay attention to other developing countries. It has also been noted that empirical investigations into spillover effects from FDI principally use econometric techniques. We have also demonstrated that the scant number of empirical econometric analyses does not allow for a more detailed description of spillover effects, making it difficult for existing techniques alone to identify and measure spillovers. For instance, in our fieldwork we observed that both positive and negative spillover effects were simultaneously recognized in the investigated Ugandan firms. Future research could continue this line of investigation, providing a qualitatively more comprehensive investigation of spillovers from FDI.

Meta-analyse structural sources of heterogeneity regrading FDI source and recipient countries.

The conditions in the FDI host country appear to be important for potential spillovers, and hence can contribute to an understanding of the sources of the heterogeneity of effects (Javorcik, 2004b; Meyer and Sinani, 2009; Smeets, 2008). For instance, as Crespo and Fontoura (2007) identified, difference (similarity) in languages and cultures between FDI origin and destination may limit (enhance) the assimilation of technologies by local firms. Similarities between the FDI source and recipient countries may also be captured by differences in the stage of development. The learning ability of domestically owned firms might also depend on the type

of foreign trade regime which is the key aspect of institutional environment (Meyer and Sinani, 2009). Unlike the open trade regime, domestically owned firms operating in a heavily protected and restrictive institutional environment for instance, could be inefficient and are unlikely to strengthen and practice their ability to learn from foreign firms. Consequently, trade openness in a host country may generate the capability and motivation to adapt and learn from a competitive market environment as well as enhancing superior technology transfer (Meyer and Sinani 2009).

Other characteristics such as perception of corruption and the protection of patent rights can also contribute to heterogeneity. For instance, on the one hand, '[s]trong intellectual property rights induce multinational enterprises to transfer more and higher quality knowledge to their subsidiaries, thereby increasing knowledge spillover potential, but they make it more difficult to capture knowledge spillovers' (Smeets, 2008:122). On the other hand, weak intellectual rights are more likely to result in the transfer of less sophisticated foreign firms (Javorcik, 2004b). Consequently, the net effect of patent rights may not be ex-ante clear-cut (Smeets, 2008). Likewise, high levels of corruption induce higher spillovers (Meyer and Sinani, 2009). One possible explanation could be that the technologies used by foreign firms working in countries with high level of corruption may be obtained through illegitimate means. Furthermore, higher corruption levels may help domestic firms to get protection from foreign competition.

In sum, in addition to the primary empirical studies' method heterogeneity, structural heterogeneity in terms of the specific characteristics of the host countries' requires further consideration to uncover more sources of heterogeneity in the reported spillover parameters. That is, as noted by De Groot et al. (2007), for agglomeration, innovation and regional development meta-analysis, the need for more attention to specifying key variables of interest is warranted. It was also noted that pooling the reported empirical findings from developing countries with those obtained from developed countries is not appropriate, and thus further meta-analysis is required for developed countries. This can contribute to understand the research topic in terms of sources of heterogeneity by comparing and contrasting the findings from developing with those from developed countries.

Investigate whether spillovers from FDI occur, but also how spillover effects actually take place.

There is a growing number of studies with mixed results. Theoretically, the hypothesis is that spillover effects emerge through three main channels as set out in Chapter 2. Despite this, the econometric approach adopted in the literature of the 74 primary studies that we considered, largely ignores the transmission mechanisms by which FDI spillover effects actually emerge, and thus fails to discern existing theoretical channels. This means that thus far authors of primary studies have mainly focused on the simpler question of whether or not spillovers occur. We have tried to demonstrate an empirical approach which looks at the transmission channels through which FDI generates spillover effects for the group of SSA countries under investigations. In this regard, to fill the existing research lacuna between the theoretical framework and empirical analyses, future efforts should explore this line of research for other countries. Furthermore, the importance of the transmission channels by which spillovers are assumed to emerge need to incorporate existing host country firm-specific heterogeneities.

Investigate market access spillovers and inter-industry linkages.

There are various other sources of potential for FDI-related effects that are not incorporated in this thesis. For instance, it could be important to investigate FDI-related effects through market access spillovers and inter-industry linkages. Export effects of FDI-induced spillovers are more likely to occur through imitation of the exporting process of the foreign affiliates to penetrate export markets or to increase export performance (Crespo and Fontoura, 2007). In this way, domestic firms can learn things associated with the establishment of distribution of networks, knowledge of consumers' tastes in the destination market, or transport infrastructure (e.g. Aitken et al., 1997; Görg and Greenaway, 2004; Kokko et al., 2001).

Alongside the exporting process of FDI, the importing of intermediate inputs can also be related to the transmission channel. Importing might offer host country firms access to superior intermediate inputs by allowing them to follow the importing operations of foreign-owned firms. The latter resembles the case of inter-industry (vertical) linkages, which can be interpreted as knowledge transfer instead of knowledge spillovers. In sup-

port of this, empirical evidence demonstrates that importing is one important vehicle of knowledge transfer (e.g., see Acharya and Keller, 2009). Regardless of the nature of the effects from FDI, investigating such effects is relevant but also requires additional information. For instance, investigating the inter-sector effects requires detailed information on the input-output matrices of the inter-sector relationships between foreign and domestic firms. This kind of information was, however, not available in our dataset. In this regard, future research would require an incorporation of these and other related effects of FDI in the host countries in order to provide a further description of the impact of FDI on local firms in host countries.

Explain more heterogeneities in FDI characteristics.

In this thesis, we have only demonstrated one source of heterogeneity in FDI characteristics, namely the degree of foreign ownership. We believe that FDI from different countries is unlikely to generate similar spillover effects. Several factors can be associated with sources of heterogeneity in FDI for different potential spillovers. These factors can be associated with the FDI levels of technological characteristics, the types of FDI mode of entry, the home country or nationality of FDI, the motives for FDI in terms of international production, the distance from the FDI source country, among others. For instance, Banga (2001) states that the nationality of the FDI source countries is expected to enhance spillovers differently as technological levels and modes of transfers are different between the investing countries. Banga presented the cases of US FDI and Japanese FDI in Indian firms and concluded that greater spillovers are expected from the latter. In this thesis, the dataset employed to investigate the transmission channels did not permit an exploration of these and other heterogeneities related to FDI.

Hence, alongside the heterogeneity of the domestic firms, future research should aim to investigate the different sources of heterogeneity in FDI, such as technological characteristics, modes of entry, nationality of the source country, motives for transnational production, among other aspects. Future research efforts should also aim at exploring this line of research by directing the investigation into a research design that allows for a separation of the transmission channels with respect to the numbers of years by which foreign firms have been operating in the host country. The dataset available for this thesis did not permit us to identify time since

FDI entry. Such an investigation may also assist in testing the hypothesis of survival bias.

Research into the crowding out effect of the competition channel.

Competition due to the presence of FDI can restrict domestic firms' market power and share, which can be interpreted as either a market-losing or crowding out effect. One would expect the presence of foreign firms to draw resource away from domestic firms and this may either reduce the market share of domestic firms or push domestic firms out of their market if they are unable to compete. We have shown that loss of market share is common in SSA industries. However, due to the data limitation of the Enterprise Surveys, this thesis does not investigate and identify the other negative components of the competition channel - crowding-out effect. This thesis could also not provide the result of Ugandan firms that left the local market prior to our fieldwork due to increased competition from FDI. Hence, future research should also aim to explore crowding-out effects in order to describe and gain a more complete picture of the competition-determined spillovers.

Appendices

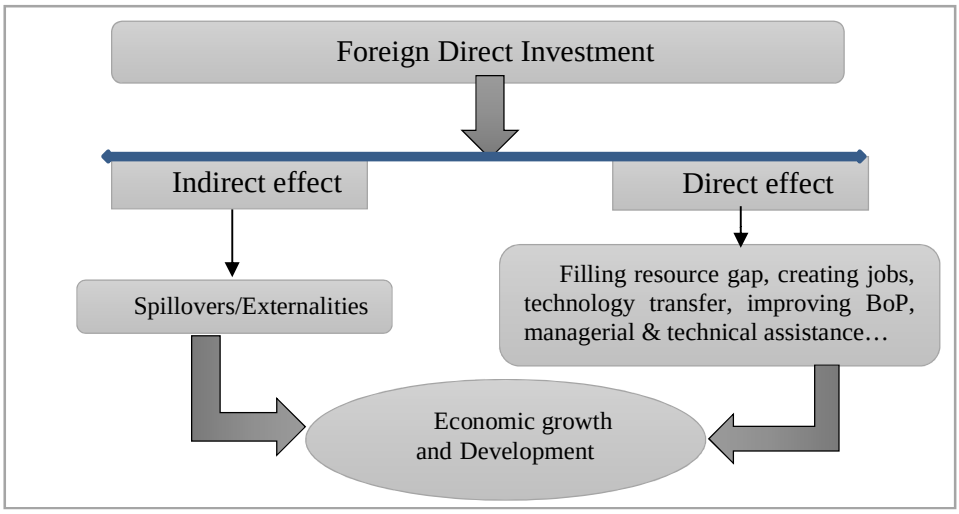
Appendix A2.1
Overview of FDI effects for host country

As shown in Figure A2.1, FDI is understood to be able to generate economic growth and development (Kinuthia and Murshed, 2015; Murshed, 2010) in the host country through two effects: direct and indirect effects. According to Dunning (1992:263)

> … the direct effects embrace the role of foreign firms as providers and controllers of resources and capabilities to host countries, and the effects of these ownership advantages on the way in which resources and capabilities are allocated both between and within sectors in an economy. Whereas, the indirect effects are related to the impact of the [FDI] activities on their suppliers, competitors and customers, as well as, more generally on the host economy of which they are part.

More specifically, direct effects in the host country are to receive capital needed to bridge a resource gap (Asiedu, 2002; van Bergeijk and Lensink, 1993; Naudé and Krugell, 2007); to create employment opportunities and training for local employees (Gershenberg, 1987; Kokko, 1996; Moosa, 2002); to transfer technologies (Kinda, 2010; Kokko, 1996); to offer managerial and technical assistance (Javorcik and Spatareanu, 2008); to serve as a bridge to foreign markets (Kinda, 2013; Moosa, 2002); and to boost the balance of payments (BoP) position (Kinuthia, 2013; Robbins, 2013).

Figure A2.1
Linking FDI to its direct and indirect effects



Source: Author's own design.

First, the role of FDI as a provision of capital has become more important over the last decades for many developing countries. This stems from the fact that developing countries encounter the problem of domestic savings and thus need to increase their savings to match their investment needs (Benjamin, 2012). An external source of capital is therefore required to supplement the savings-investment gap. FDI is considered the main source of capital since other forms of external financing such as bank lending and official development assistant (ODA) have become unreliable and in short supply, respectively (Nunnenkamp, 2004). Hence, FDI is seen as vital to fill this gap as the benefits outweigh other sources of capital in terms of being more stable and providing long-term commitment. Furthermore, FDI includes risk sharing (Asiedu, 2002).

Second, FDI is associated with creating employment in the host country. This may happen either directly by the setting up of entirely new facilities, as in the case of greenfield investment, or indirectly through stimulating employment opportunities in distribution facilities. FDI can stimulate attractive employment opportunities and demands skilled labour, which in turn may also encourage the government of the host coun-

try to invest in training and education (Blomström and Kokko, 2002). Foreign subsidiaries use local employees, and thereby also provide the possibility of training (Blomström and Kokko, 1998). Gershenberg (1987) supports the importance of foreign subsidiaries for the training of local employees based on data obtained in 1982-83 from Kenya. In that particular case, FDI appeared more likely to engage actively in the training of local employees relative to local firms. UNCTAD (1994) shows that training expenditures per employee by foreign firms in a host country usually exceeds or at least matches that of their parent company in the home country. Furthermore, the benefit of better training is associated with entrepreneurial ability to search for better investment opportunities and managerial efficiency in operations (Blomström and Kokko, 2002).

Third, formal or intentional technology transfer is associated with FDI as an internal transfer of technological knowledge from the parent company in the home country to affiliates in the host country (Jordaan, 2012). This is considered to be a critical factor in the discussion of FDI regarding the potential for spillover benefits. Fourth, it is argued that the presence of commercial linkages between foreign affiliates and domestic firms (either downstream or upstream) can lead to an intentional transfer of managerial, technical and commercial assistance. A study conducted by Javorcik and Spatareanu (2008), for instance, argues that foreign firms have an incentive to protect knowledge leakage that potentially benefits local competitors, but also have an incentive to assist with the planned transfer of knowledge in upstream sectors that may benefit the foreign firms in terms of improved quality and performance of intermediate input suppliers.

Fifth, foreign affiliates may enable to bridge to foreign markets either to enter new markets or to increase sales in existing markets. The argument is that foreign affiliates may facilitate the entry or expansion of trade to foreign markets by providing knowledge of foreign product markets, transport infrastructure, and distribution channels. Last, the foreign affiliates may also affect the BoP of the host country either through import-substitution or export-oriented FDI.

Appendix A2.2
Theories explaining FDI activities

This section discusses theories explaining FDI activities across national boundaries. These explanations can be classified into two sides: supply

side and demand side. The supply side determinants are derived from the theory of the firm and include variables related to the investing firm itself. The demand side determinants are related to the host government's policies or objectives to attract FDI. In theory, as outlined in the overview of FDI effects, there are various perceptions related to how FDI can facilitate potential positive effects, such as growth, capital, technology, and skill upgrading for the host country. On the supply side, the development of theories on the industrial organization of firms have contributed to a better understanding of FDI activities.

Appendix A2.2.1 Supply side determinants

Industrial organization theories of the firm suggest that market imperfections that possess unique advantages may induce companies to undertake international investment. An early contribution to this research is Hymer's doctoral thesis written under the supervision of Kindleberger and submitted in 1960 but not published until 1976. Stephen Hymer's main research was to look at why US firms invest in Europe with the cost of acclimatizing to a new business environment and then how they compete with local firms with their additional costs of doing business across national boundaries. His theory explains that a company that is involved in FDI is an oligopolistic firm that has advantages of superiority and that to make investments viable is searching for control in an imperfect market to maximize its profits. He states that to make investments viable, a multinational corporation (MNC – an entity that engages in FDI through international investment/production) should possess ownership advantage over host firms. His research led to three other theoretical contributions to explain the existence of FDI. These highlight the location advantages, the internalization advantages and an eclectic paradigm which will be discussed in the next subsections.

A2.2.1.1 Ownership advantages approach

The first strand of theoretical contributions that sought to explain FDI activities across national boundaries was put forward by Hymer (1960) and later by Kindleberger (1973) and is therefore often referred to as the Hymer-Kindleberger paradigm. Hymer argues that FDI exists as a result of two factors. First, as an attempt to remove or at least to reduce international competition via domestic expansion of monopolistic power in host countries. Second, as a desire to insure investment safety through increasing the returns using the special advantage of the foreign firm itself.

Accordingly, MNCs should possess specific ownership advantage in order to undertake foreign production and thus ensure their survival. This is because they face additional establishment costs in host countries relative to local firms.[1] Hymer defines specific ownership advantages as input market imperfections which can allow buying at lower prices, superior techniques of production, international experience, managerial and marketing skills, ownership of brand name, and better access to finance. These types of ownership advantages are critical and act as a prerequisite to undertaking FDI (Buckley and Casson, 1976; Teece, 1985).

Hymer's ownership advantage is the initial source of benefit from competitiveness. We also view these ownership advantages as a source of benefit to host firms to learn from. For instance, ownership advantages in terms of superior foreign technology are expected to transfer to local firms, resulting in spillovers. In contrast, Hymer concluded that FDI has largely negative consequence in host countries in which the ownership advantages allow MNCs to suppress local competition and access cheap factor markets.

It is noted that ownership advantages contributed to understanding FDI activity across national boundaries. However, this theory considers these advantages as given since there is no explanation provided on how these advantages are generated. In this case, they appear as 'manna from Heaven' (Buckley and Casson, 1976:69). Furthermore, the costs related to planning and investment necessary to build up the advantages that the foreign firms are supposed to possess are not explicitly taken into account. Hence, this approach can overstate the overall profitability for foreign firms. Hymer's idea of market imperfections motivated a flurry of researches. His approach further developed by, among others, Vernon, (1966), Buckley and Casson (1976), and Dunning (1981) in the form of the theory of location advantages, internalization, and eclectic paradigm, respectively.

A2.2.1.2 Location advantages approach

Hymer's ownership advantages treat the location advantages as exogenous factors in explaining the FDI behaviour. In contrast, the second strand of

[1]The additional costs of establishment and operation for a foreign firm: first, local firms have better knowledge of local customer tastes, the institutional and legal framework, and business customs. Next, foreign firms generate operation costs related to communication and time lost in organizing information and decisions and also in misunderstanding costs that can lead to errors. According to Hymer, the foreign firm should possess some ownership advantages that allow it to compensate for these costs when competing with local firms.

economic theory, the macroeconomic development approach, relies on the influence of location to explain FDI activities (e.g., Vernon, 1966). The product cycle theory (PC) developed by Vernon (1966) is also intended to explain the substantial rise of US initiated FDI in Europe. The PC theory states that a firm first exploits foreign markets through exports and later undertakes FDI as a product moves through its life cycle.[2] In this setting, the location advantages of host countries are taken into account based on the three stages of the product life cycle, namely, new-product, maturing product, and standardized product (Vernon, 1966). Accordingly, the probability that a firm will undertake foreign investment changes as its product moves from the new product stage to the maturing and to standardized stages.

At the new product stage, US firms produce a product domestically since there is uncertainty about product demand and there is a need to keep the new production process within arm's length of the parent firm/innovator. It follows that initially the new product is not standardized, as it needs continuous improvement in its design (for instance, product technology enhancement with alternative input experimentation) and adaptation to fit to consumers' needs. Vernon also argued that there is a need for a high degree of flexibility to change inputs, for highly skilled labour, and for quality infrastructure that are important at the new stage of the product. Hence, when a firm deals with a new product's technology, production should be located close to the product market as substantial communication between production and marketing is required. Furthermore, Buckley and Casson (1976) assert that the main incentive to create new products is an increase in per capita income, and labour scarcity, indicating labour-saving stage of a new product cycle.

At the maturing of the product stage, a firm invests on production facilities across national boundaries where demand is sufficiently warrant new production activities. In this stage, the need for production flexibility decreases and the product is stable. During the new product stage, practices enhance an efficient product and production process while discarding the less efficient ones. Product technology is well-established and thus distance between production and marketing become less important.

[2] When a foreign product first emerges, firms sell through exports. According to Buckley and Casson (1976), exporting continues whenever the marginal production costs in home country and marginal transportation costs to the host country are less than the average cost of production in the host country.

Vernon argues that US firms moved to Europe where there were relatively cheaper factors of production, lower transportation costs and higher product demand: thus indicating the location advantages of the host country.

At the final phase, standardized product, the product becomes undifferentiated. Product demand becomes price-elastic as market competition is based on price alone. Vernon further argues that as the product become standard, market information is less important and production needs more labour-intensive process. Firms may look for larger economies of scale and cheaper factors of production, and thus developing countries may provide better competitive advantages as a production location. Correspondingly, according to Kojima (1978), product production is standardized and technologically stable, so that the R&D role and/or managerial skills become less important. Rather, semi-skilled and unskilled labour becomes more decisive. Accordingly, at the standard stage of the product, a firm may undertake FDI in low-cost developing countries as a response to pressure to reduce costs and deal with increased competition.

According to Buckley and Casson (1976), the PC theory focuses first on technological innovation, then improvement of the product and finally on the effect of these two factors on a firm's location strategy. This may suggest a coherent view of US firms at home and across national production. However, product differentiation to fit the local context as well as non-standardized products produced in host countries are not incorporated in the PC theory, making the theory unable to fully explain features of foreign investment. For instance, as products move abroad, the production facilities may require R&D to familiarize the matured product to the local context and demand. Furthermore, the PC theory explains the sequence or the path at which the product life cycle occurs, but not the rate at which the it occurs. It predicts what will happen next in the product life cycle, but it does not inform how soon the predicted life cycle event will occur.

A2.2.1.3 Internalization advantages approach

The third strand of theoretical contribution to explain FDI activities across national boundaries was that of Buckley and Casson (1976) coined as the theory of internalization. According to them, this school of thought focuses on the notion that a firm aspires to organize its own internal market based on transaction costs. They define the cross-border activities as the transaction costs needed by a firm to extend its direct operations and

gain control and ownership of activities undertaken by other markets whenever these transactions can be organized at a lower cost. Hence, the concept of internalization is concerned with extending the direct activities of a firm through incorporating ownership and control of markets that link firms directly to customers. In this concept, the creation of internal markets is mainly caused by the existence of transaction costs. According to Rugman (1980), transaction costs include, amongst others, the taxes paid on exchange transactions, the brokerage costs of finding the correct price, the costs of foreign exchange, and the costs of defining the obligations of parties in a contract. Profit maximization through minimizing these transaction costs is the foundation of firms' location abroad. Rugman (1985) further asserts that when the internalization of these transactions is conducted through FDI in host countries, internalization becomes the general theory of FDI.

The Buckley and Casson's internalization paradigm (1976) relied on three hypotheses. Firstly, MNCs maximize profit through the presence of an imperfect market. Secondly, whenever transaction costs can be lowered, there is an incentive to create internal markets to replace more costly external ones. This brings common ownership and controls of the different activities of firms. Thirdly, internalization (the incentive to bypass intermediate markets or create internal markets) offers a firm the opportunity to engage in foreign production activities. In using these hypotheses, they compared the benefits of creating an internal market (internalization) and its costs (such as communication costs, problems of ownership and control, and market organization). Then, it was argued, the growth of foreign production is mainly governed by the benefits and costs of internalizing markets. Accordingly, internalization is undertaken up to the point where the costs and the benefits are equal. In this setting, Rugman (1980) emphasizes that a firm controls the production and distribution of its product in the host country assuming that the benefits of internalizing the market is sufficient to offset additional costs of operating abroad (i.e., the costs related to internal transactions or markets).

As outlined above, internalization theory appears to be a general theory to explain how a firm chooses to develop its activities across national boundaries by internalizing foreign markets (Buckley and Casson, 1976; Rugman, 1980). As we shall see in the next section, however, Dunning (1981) argues that the internalization paradigm is not sufficiently powerful to fully understand foreign production. He asserts that the location and

ownership advantages should be incorporated into the internalization approach and it is this that led him to develop the eclectic paradigm. Hence, Dunning's eclectic paradigm combines the location, internationalization and ownership advantages in order to better understand FDI activity.

A2.2.1.4 The OLI approach

The fourth strand of economic theory draws upon and integrates the three strands of theories described above. Dunning's approach to explain the FDI activity is referred to as the eclectic paradigm. This paradigm sought to incorporate the internalization theory with its focus on ownership-specific advantages and location-specific advantages. The principal hypothesis of this theory suggests that the propensity of a firm to engage in foreign production depends on three conditions being fulfilled: ownership-advantages, location-advantages and internalization-advantages.

Dunning argues that the ownership-advantages refer to firm-specific characteristics that are not available to the host firms. These advantages can include process and product technology, economies of scale, name recognition, patent rights, or management and organizational skills. Accordingly, the better the ownership advantages a firm possesses, the more likely FDI is to take place. However, this describes a necessary but not a sufficient condition to undertake FDI. This is because with ownership advantages alone, a firm could simply export. Hence, it becomes important to consider the location-specific advantages to explain the choice for FDI.

The location advantages refer to the location-specific characteristics of a host country that are external to firms undertaking investment. Location-specific advantages can include factor endowment, market size, government regulation, transportation costs, infrastructural factors, non-tariff or tariff barriers, or the political relationship between the FDI home and host countries. The more these advantages a host country has, the more a firm is motivated to locate business across national borders.

The internalization advantages refer to when a firm believes that ownership advantages can be better exploited through foreign production in host country than through operating from abroad. Dunning emphasizes that the motivation for the internalization advantages is related to external market failures/imperfections. According to him, market imperfections are classified into structural and natural. The structural imperfections include deviation from perfect market competition derived from ownership of superior technology, access to better inputs or product differentiation,

while the natural imperfections include barriers to flow of information. The greater the market imperfections, the greater the incentive for a firm to exploit competitive advantage by establishing operation in the host country.

In sum, Dunning's eclectic approach (1981) sought to explain that a firm engages in FDI when the following elements are fulfilled:

i. Possesses ownership advantages over host country's firms.

ii. Assuming condition (i) is fulfilled, it must be beneficial to use these advantages rather than of leasing or selling them to other firms. In other words, it must be beneficial to internalize the advantages through extending its own activities rather than of externalizing them to independent firms through contracts or licensing.

iii. Assuming both condition (i) and (ii) are fulfilled it must be profitable to locate abroad to utilize the advantages rather than of serving through exports.

Accordingly, Dunning's second element of eclectic paradigm is similar to Buckley and Casson's (1976), and Rugman's (1980, 1985) internalization element. Although Dunning gave explicit recognition to the ownership advantages and location advantages, he firmly stresses that foreign investment would lead to contractual or licensing agreements unless a firm has the ability or incentive to internalize foreign production. He argued that this setting of the eclectic paradigm is the distinctive element of this approach. However, according to Rugman (1985), the internationalization approach posited using the last two elements (as outlined above) of the eclectic paradigm is made on the basis that any firm-specific ownership advantage has to be internalized in order to be effective. Further, Rugman asserts that the internalization theory leaves the location advantages as a second determinant of FDI but that these need to be decided simultaneously with the ownership advantage. Accordingly, the internationalization approach is still considered as the general theory on undertaking FDI. In this respect, it appears that the eclectic paradigm vies with the theory of internalization.

A2.2.1.5 Trends in the theories of FDI and implications

We have presented four strands of literature that sought to better explain the question why FDI exists. The theories were first advanced by Haymer (1960) looking at ownership advantages and then by Vernon (1966) with

location advantages. The theories were further synthesized by Buckley and Casson (1976) using the internalization approach, followed by Dunning (1981) who melted the previous three theoretical elements together. Hence, in the 1960s, there were two principal strands of economic theory based on the *why* approach and the *where* approach. The first strand was based upon the why, approach by identifying the characteristics of a firm that will provide it with competitive ownership advantages vis-à-vis the host firms to undertake international production rather than of utilizing its advantages through exports or other contractual agreements.

The second strand of economic theory was based on the where approach to explain firms' production activities in one country rather than in other countries. Vernon also added the *when* approach to the why and where approaches to explain FDI activities. Both strands (ownership and location advantages) of economic theories were initiated independently to explain foreign production, and are thus individually not fully satisfactory to a better understanding of FDI. The first did not seek to answer where firm ownership advantages can be exploited, whereas the second did not attempt to explain how a firm could outcompete with domestic firms in the host county. Furthermore, the latter does not consider non-standardized products and product modification to fit local contexts. Most importantly, Vernon provides a generalization of the path a product moves through in its life cycle. However, he does not predict the rate at which a product's life cycle event will occur but only considers what will happen next in the life cycle of products.

The third strand merely focuses on how making markets within a firm, that is, it focuses only on the tendency to create internal markets in in order to understand why foreign production exists. A firm is assumed to replace various external market functions with internal markets whenever the costs of market transactions are greater than the costs of internal transactions or when external markets cannot exist at all. Internalizing markets make it possible for a firm to produce goods at an international level similar to those developed in home markets. In this way, internationalization is presented as a general and unified theory of FDI (Rugman, 1980). Correspondingly, Rugman (1980:365) argues that the existing theories of FDI are '… basically sub-sets of the general theory of internalization'. For instance, the importance of the internalization theory to Vernon's PC theory lies in the source of the motivation for R&D that promote a new product. As Rugman (1980:372) states:

> [t]he appropriate questions to ask are: what generates the initial research discovery in the home nation, and how can there be successive waves of product cycles once such research discoveries continue on a dynamic basis? Clearly, the dynamic nature of research generation lies at the heart of the theory of internalization, so the product cycle model is a sub-case of it. Once the motivation of research is explained by internalization then everything else in the product cycle model follows.

However, it appears that internalization theory does not explain the existence of all aspects of international operations or types of FDI. For instance, according to Parry (1985), an international response to a market imperfection through an FDI response to trade barriers fails to explain why FDI is preferred above other forms of international response such as production agreements or licensing. In the context of minimizing the risks of foreign production, joint ventures through local equity requirements and strategic choices by foreign firms can also be the outcome of international operations, but it is not explicitly stated how the internalization theory explains them.

The fourth strand of economic theory draws upon and melts the three main vehicles of the previous theoretical approaches. Dunning asserts that the OLI advantages are sufficient to explain the tendency and ability of a firm to serve foreign markets through foreign production rather than of exports or contractual agreements. However, the OLI advantages demonstrate that although they are sufficient to explain across national boundary production, they do not often appear to be needed altogether. Casson (1987) argues that the ownership element of the eclectic approach is not necessary since the combination of location and internalization advantages are sufficient to explain the existence of foreign production. Casson (1987:33) shows that:

> when profit tax rates are not harmonized between two countries, firms in an industry whose product is mined in one country and processed in another have an incentive to merge in order to minimize joint tax liabilities through transfer pricing.

In this context, a combination of transfer pricing and location advantages predicts that a foreign firm in a host country can compete successfully with local firms. In this theoretical situation, it appears that Dunning's eclectic theory fails to recognize the possibility that markets can be internalized rather than only a specific ownership advantage. Rugman

(1985), on the other hand, leaves out the location element from the eclectic approach to show that the internalization element is still a general theory of why FDI exists. This makes other FDI theories the sub-sets of an integrated internalization theory. In this respect, it is why we consider that the eclectic approach vies with the internalization approach.

The implications of the outlined theories are that FDI is a source of capital transfer as the case in portfolio investments. The latter, however, incorporate only a transfer of one element of FDI, which is capital. Conversely, the former refers to a transfer of a composite of package that includes capital, management, know-how and technology (De Mello, 1997; Fan, 2002). For instance, the entry of FDI into host countries brings superior technology that can provide foreign firms with specific ownership advantages that allows them to compete with domestic firms. In view of this, FDI presence may force domestic firms to be more competitive by encouraging them to use existing resources and technology more efficiently or even adopt new technologies. It can also put domestic firms in a position to imitate superior foreign process and product technology. Consequently, FDI is expected to generate various effects on the host countries through the different transmission channels.

The theoretical thoughts discussed in this section attempt to reflect on FDI spillover effects for host firms. Along the same line, Caves (1974), an early proponent of industrial organization theory (IOT), states that the effect of foreign presence can be classified into allocative efficiency, technical efficiency and technology transfer. Theoretically, allocative efficiency occurs when the presence of foreign firms provides competition in the host markets. This could minimize the distortion due to monopolistic behaviour, thereby enhancing productivity by improving the host county's resource allocation. Technical efficiency is related to the demonstration/imitation of new products or processes from the foreign subsidiaries. Technology transfer relates to the speedy dissemination of technology and innovation by foreign firms to local firms in the host nation. Consequently, the effect of competition, demonstration and training and learning by doing can lead to an increase in productivity for domestic firms (Blomström and Kokko, 1998).

Nevertheless, the four strands of economic theory focus merely on the supply side, which is FDI. Furthermore, the approach of both Hymer's pioneering research and of his successors relied on the concept of markets imperfection. This can create monopolistic behaviours in which foreign

firms can keep control of output and price to realize monopolistic gains and thus tend to protect technology and innovation leakage to local firms. It is argued that they raise entry barriers, increase agglomeration, make national production and innovation systems difficult, and disrupt existing production patterns (Dunning, 1981; Hymer, 1960). Besides, when foreign firms' motivation to invest is solely technology sourcing, FDI might have no effects or even negative effects (Girma, 2005). In such theoretical context, the impact of foreign presence leaves with conflicting concerns and it is therefore difficult to conclude that domestic firms will gain spillovers from the entry and operation of foreign firms. Hence, both pro-competitive and anti-competitive consequence were suggested as potential impacts of foreign production in host countries.

Endogenous growth theory (EGT) viewed FDI as an important vehicle for spillover effects, technological development and human capital accumulation that were expected to positively affect economic growth (Grossman and Helpman, 1991). The IOT offers a theoretical framework on how FDI emerges across national production. However, it fails to provide insight into how FDI stimulates technological progress. In contrast, EGT explores the theoretical framework of technological progress channelled through technological diffusion, transfer, and spillover effects (Liu and Wang, 2003). In this regard, FDI is viewed as an important channel for transmitting advanced foreign knowledge to the recipient country that may lead to local technological and human capital development (Grossman and Helpman, 1991).

Accordingly, FDI is considered to influence the economic growth of the host economy through spillover effects and technological transfer. However, potential spillovers may not emerge automatically, indicating a requirement by the FDI recipient country to possess a certain capability to absorb advanced foreign technology in order to enhance economic growth. That is, the occurrence of spillover effects can be explained by the interaction of FDI presence alongside specific factors in the host economy. These specific factors may include the absorptive capacity of local firms (e.g., see Wang and Blomström, 1992) and the technological difference between local and foreign firms (e.g., see Kokko et al., 1996) among others. Accordingly, empirical studies based on EGT involve the extent to which local firms in the host countries possess the capability to benefit from FDI-related spillover effects (see Chapter 2 for a thorough presentation).

Appendix A2.2.2
Demand side determinants

Domestic investment which is largely determined by the level of national saving is the engine for sustainable economic growth and development. It reduces poverty, augments employment and improves economic growth (Benjamin, 2012). However, most developing countries have a rather inadequate domestic savings rate (Adams, 2009). Accordingly, many governments want to promote FDI based on the perception that FDI is increasingly able to fulfil their development objectives. Most governments not only relax policies restricting FDI, but also actively facilitate FDI as it constitutes an important element of their economic growth and development policies as observed in Figure A2.1.

FDI, therefore, can provide or increase capital investment. In particular, this has become very important for developing countries in which domestic savings do not match domestic investments. FDI is also viewed as more stable and risk sharing than other forms of external financing such as bank lending, ODA, remittances, and portfolio capital flows (Nunnenkamp, 2004). Furthermore, FDI is generally considered to be more productive relative to domestic investment. This is because FDI is assumed to incorporate a bundle of important components such as advanced production technologies in the host country. This means that it encourages not only the flow of capital, but also facilitates technological spillovers and managerial knowledge, direct and indirect employment opportunities, and serves as a bridge to foreign markets (Amendolagine et al., 2013; Kinda, 2013; Naudé and Krugell, 2007; Stiglitz, 2000). By attracting FDI to the host country, host governments expect to gain access to this bundle of important elements. This has resulted in many countries enthusiastically setting policies that are more favourable to FDI such as providing measures affecting investment. In 2004, for instance, more than 80 countries introduced 164 changes in investment policies affecting FDI, and 87 per cent were favourable to promoting FDI (UNCTAD, 2015).

Consistent with the change in host countries; policy measures in favour of FDI, there has been a significant increase in global FDI inflows over the past three decades. In 1980, global FDI inflows stood at US$59 billion, grew significantly in 2000 to US$1,433 billion and reached a new record high in 2007 to US$1,833 billion, which surpassed the previous record set in 2000 by nearly 22 per cent (UNCTAD, 2015). During this period, the

bulk of the global share of FDI took place mainly among developed countries. In general, until 2007, about two-thirds of the global share of FDI was absorbed by developed countries (UNCTAD, 2012). It is only in 2010 that developing countries, together with the transition economies, surpassed the 50 per cent mark of global FDI inflows (UNCTAD, 2015). This shift in the FDI landscape continued to grow in favour of developing countries. In 2012, developing countries alone accounted for a share of 52 per cent of the total FDI inflow which was a highest ever (UNCTAD, 2013). In 2014, FDI inflows to developed countries further fall to 40 per cent of the global share (US$499 billion), whereas developing countries absorbed a record share of 55 per cent (US$681 billion) of the global FDI inflow (UNCTAD, 2015).

In a number of developing countries the substantial increase in FDI penetration has been widely recognized as an economic-enhancing factor (Kohpaiboon, 2006). FDI has therefore not only become an important source of financing, but has also often been seen to play a central role in investment in recipient countries. For instance, in numerous theoretical studies FDI is considered to transfer new products and advanced technologies, train local employees and provide managerial and technical assistance (Kokko, 1996; Stiglitz 2000). The knowledge transfer is expected to spread over the entire economy, leading to an enhancement in domestic firms' technological capability and thereby generating sustainable economic growth in the host country (Jordaan, 2012; Salim and Bloch, 2009).

Hence, one of the demands to attract the huge FDI inflows becomes the expectation that FDI may indirectly boost the productivity of domestic firms. Over the last three decades, the micro-element of FDI has been receiving growing recognition. Domestic firms can indirectly benefit from the presence of FDI in the form of technological externalities. It is argued that when foreign firms enter the host country's market, the former bring more advanced technology, managerial practice, production methods and other tacit and codified know-how (Blalock and Gertler, 2009). This proposition has led to a growing number of empirical studies seeking to investigate spillovers from the presence of FDI in various host economies.

Table A4.1

Bivariate PET-MRA for genuine spillover effects: Sensitivity analysis with the inclusion of outliers

Panel 1:MEM				
Variables	***All-studies***		***Peer-reviewed studies***	
	t-value	***Effect size***	***t-value***	***Effect size***
Bias/FAT	0.877** (2.19)	0.196* (1.83)	1.018 (1.66)	0.181 (1.62)
Genuine effect/ PET	-0.000 (-0.28)	0.129 (1.14)	-0.000 (-0.61)	0.107 (0.67)
Observations	1,446	1,450	778	782
Studies	69	69	43	43
Panel 2:CDA				
Variables	***All-studies***		***Peer-reviewed studies***	
	t-value	***Effect size***	***t-value***	***Effect size***
Bias/FAT	0.525*(1.76)	0.190* (1.95)	0.565 (1.10)	0.172 (1.66)
Genuine effect/ PET	0.000 (0.35)	0.109 (1.12)	-0.000 (-1.23)	0.076 (0.48)
Observations	1,446	1,450	778	782
Studies	69	69	43	43

Note: See Table 4.2. Test for between-study heterogeneity (*Q*-test) is 64256.49***on 1,445 degrees of freedom with p-value less than 0.001and I^2 statistics is 97.8%.

Table A5.1

Testing for sample attrition: probability of dropping out of the sample

Exports	-0.091
	[0.111]
Foreign-owned	-0.131
	[0.141]
Firm size	-0.115
(20-99 workers)	[0.128]
Firm size	-0.290
(100+ workers)	[0.229]
Firm age	0.001
	[0.001]
Formal training	-0.019
	[0.019]
Technological gap	0.467
	[0.424]
Capital-labour ratio	0.031
	[0.024]
Labour force	0.000
	[0.000]
Constant	0.197
	[0.296]
N	2,586

Note: Robust standard errors in brackets are clustered at country level. The explanatory variables are used from the 2006 survey only. The dependent variable is a drop-out dummy that takes the value one if the firm is not observed in the 2014 survey and zero otherwise.

Table A5.2

Correlation matrix of variables

Variables	*lnLP*	*Exports*	*Foreign*	*Small*	*Medium*	*Large*	*Age*	*Tr*	*TG*	*I*	*LM*	*C*	*K/L*	*L*
lnLP	1.000													
Exports	0.086	1.000												
Foreign	0.243	0.156	1.000											
Small	-0.125	-0.294	-0.241	1.000										
Medium	0.077	0.085	0.089	-0.749	1.000									
Large	0.081	0.320	0.237	-0.477	-0.223	1.000								
Age	0.076	0.147	0.127	-0.285	0.102	0.284	1.000							
Tr	0.122	0.167	0.104	-0.227	0.120	0.174	0.115	1.000						
TG	-0.499	-0.106	-0.265	0.204	-0.090	-0.181	-0.130	-0.123	1.000					
I	0.253	0.067	0.229	-0.187	0.084	0.163	0.080	0.031	-0.082	1.000				
LM	0.017	0.088	0.118	-0.051	-0.036	0.124	0.013	0.007	-0.076	0.088	1.000			
C	0.040	0.009	0.013	-0.024	0.017	0.011	0.003	-0.039	-0.019	0.030	-0.002	1.000		
K/L	0.391	0.036	0.034	0.003	-0.001	-0.004	-0.012	0.093	-0.170	0.052	0.006	0.005	1.000	
L	0.034	0.312	0.160	-0.262	-0.026	0.422	0.146	0.129	-0.083	0.108	0.552	0.007	-0.009	1.000

Table A5.3
Main results: estimation for all variables

Variables	*Full sample (A)*	*Small gap (B1)*	*Large gap (B2)*	*LA capacity (C1)*	*HA capacity (C2)*
Imitation *(I)*	1.670** [0.537]	25.404*** [7.102]	-2.043** [0.594]	1.734** [0.677]	1.214 ** [0.488]
Labour mobility *(LM)*	0.0004* [0.0002]	-0.0005 [0.002]	0.001** [0.0004]	-0.0002 [0.0005]	-0.0002 [0.001]
Competition *(C)*	0.00002* [0.00001]	0.044*** [0.006]	0.002*** [0.0001]	0.00002 [0.0001]	-0.005*** [0.001]
Exports	0.038 [0.077]	0.147 [0.383]	0.531 [0.339]	0.004 [0.078]	0.239 [0.177]
Foreign-owned *(Fo)*	-0.031 [0.061]	-0.315 [0.351]	0.632 [0.385]	0.094 [0.094]	-0.214 [0.173]
Firm size (20-99 workers)	-0.018 [0.081]	-0.414 [0.309]	-0.301 [0.211]	-0.003 [0.078]	0.342 [0.248]
Firm size (100+ workers)	-0.054 [0.077]	-1.078** [0.426]	-0.664** [0.212]	-0.185 [0.105]	0.569 [0.429]
Firm age	0.002 [0.003]	-0.004 [0.007]	0.006 [0.005]	0.003 [0.004]	0.002 [0.003]
Formal training (Tr)	0.044 [0.058]	0.153 [0.253]	0.020 [0.034]		
Technological gap (TG)	-12.265*** [0.415]			-11.470*** [0.837]	-14.653*** [1.280]
Capital-labour ratio (K/L)	0.870*** [0.205]	1.942*** [0.145]	-0.039 [0.303]	0.420*** [0.105]	1.359*** [0.444]
Labour force (L)	0.000 [0.000]	0.0003 [0.0004]	-0.0001 [0.001]	0.0003 [0.0003]	0.0002 [0.0001]
$\overline{R}^2$	0.93	0.42	0.33	0.94	0.96
Observations	1,576	441	1,135	1,171	405

Note: Results are from fixed-effects estimates. Robust standard errors in [ ] are clustered at country level. * p<0.1; ** p<0.05; *** p<0.01. The dependent variable is logarithm of labour productivity of domestic firms. Regression includes time, country and industry dummies. Columns B1 and B2 represent local firms with small and large technological difference vis-à-vis foreign firms in a given industry, respectively. Columns C1 and C2 refer to local firms with low absorptive capacity and high absorptive capacity respectively. In order to avoid multicollinearity and ensure better estimates, all continuous variables used for interactions are centred by subtracting the full sample means (Aiken and West, 1991).

Table A6.1

Composition of industry distribution of investment projects

Ownership	*Industry type*	*Percentage share of the total investment projects*				
		2013	*2012*	*2011*	*2010*	*2009*
Fully-Owned Foreign Firms (FoF)	***Manufacturing***					
	Manufacture of Rubber and Plastic Products	4.1	10.9	1.2	1.8	1.3
	Manufacture of Food products and Beverages	12.4	2.6	8.4	2.3	19.8
	Manufacture of Electronics	1.0	1.8	1.7	0.0	0.0
	Manufacture of Metal and Metal Products	12.5	4.5	2.7	6.3	0.2
	Manufacture of Paper and Paper Products	0.0	0.5	4.8	3.3	0.1
	Manufacture of Soap	0.1	0.5	0.0	0.0	0.0
	Manufacture of Chemical & Chemical Products	2.9	0.7	2.7	0.2	0.1
	Manufacture of Machinery & Equipment	1.0	0.1	0.7	1.2	0.0
	Manufacture of Pharmaceuticals	0.0	1.7	0.0	0.4	0.0
	Manufacture of Tobacco and Tobacco Products	0.0	0.0	0.0	0.6	0.0
	All other Manufacture	19.8	31.5	15.1	39.7	57.0
	All Manufacture: fully-owned foreign	**53.8**	**54.7**	**37.3**	**55.8**	**78.6**
Joint Ventures (JV)	All other Manufacture	0.2	9.6	4.3	2.4	0.0
	Manufacture of Rubber and Plastic Products	0.1	0.4	0.0	0.0	0.0
	Manufacture of Food products and Beverages	2.3	0.0	0.9	0.3	0.0
	Manufacture of Metal and Metal Products	0.4	0.0	0.0	0.0	0.8
	All Manufacture: joint ventures	**3.0**	**10.0**	**5.5**	**2.7**	**0.8**
	All other Manufacture	2.4	1.2	7.7	11.8	3.6
	Manufacture of Rubber and Plastic Products	1.3	2.1	6.4	3.7	0.0
	Manufacture of Food products and Beverages	8.0	1.4	18.2	6.0	2.4

Domestic Firms (DF)	Manufacture of Electronics	0.5	0.0	0.0	0.0	0.0
	Manufacture of Metal and Metal Products	3.3	8.5	3.2	8.4	0.0
	Manufacture of Paper and Paper Products	0.7	7.1	1.8	2.4	0.6
	Manufacture of Soap	0.6	1.6	0.1	1.4	0.1
	Manufacture of Tobacco and Tobacco Products	2.5	0.0	0.0	0.0	0.0
	Other Manufacture	23.7	13.2	16.7	7.5	14.0
	Manufacture of Chemical & Chemical Products	0.0	0.1	1.6	0.3	0.0
	Manufacture of Machinery & Equipment	0.0	0.0	1.4	0.0	0.0
	All Manufacture: domestic	**43.2**	**35.2**	**57.2**	**41.5**	**20.7**
Fully-Owned Foreign Firms (FoF)	***Services***					
	Other Services	45.0	29.3	27.2	12.2	28.2
	Hotel & Restaurant	0.5	1.8	2.9	1.9	0.3
	Construction	12.3	2.1	5.6	7.1	6.2
	Transport, Storage & Communication	2.7	10.5	3.6	3.9	8.6
	Wholesale & Retail	0.7	1.4	3.2	1.5	1.0
	All Services: fully-foreign owned	**61.2**	**45.0**	**42.5**	**26.4**	**44.1**
Joint Ventures (JV)	Other Services	0.4	0.2	8.1	4.1	1.1
	Hotel & Restaurant	0.2	0.3	4.6	0.0	0.0
	Construction	4.7	0.0	0.5	0.0	0.0
	Transport, Storage & Communication	0.5	2.2	0.0	0.0	0.0
	Wholesale & Retail	0.1	0.3	0.0	0.0	1.0
	All Services: joint ventures	**5.9**	**3.0**	**13.4**	**4.1**	**2.1**
Domestic Firms (DF)	Other Services	25.0	32.7	31.4	32.1	16.1
	Hotel & Restaurant	0.4	4.4	0.0	8.4	0.1
	Construction	2.4	9.7	5.8	16.2	25.4
	Transport, Storage & Communication	5.0	1.3	4.2	4.2	10.0
	Wholesale & Retail	0.0	3.9	2.8	8.4	2.1
	All Services domestic	**32.8**	**52.0**	**44.2**	**69.4**	**53.8**

Source: Author's calculations using data from the UIA, 2015.

Table A6.2
List of firms excluded from the on-site interview

Firm name	*Sector type*	*Reason for exclusion*
1. Hariss International	Food Products & Beverages	Refusal: 4th May
2. Great Wastes And Recycling Foundation	-	Missing Location
3. Crane Roofing	Construction	Inaccessible as of 13th May
4. China Nanjig International	Construction	Refusal: 14th April
5. Guo Star Enterprises	Agriculture Business Activities	Does not apply
6. Walmax International	Wholesale & Retail	Inaccessible as of 17th April
7. Budget Enterprises	-	Inaccessible as of 26th May
8. Tirupati Development Uganda Business	Construction	Does not apply: same as Tirupati Development, interviewed on 5th May
9. Ankole Adventures	Adventures services	Does not apply
10. Kikonyogo Investments	Hotels & Restaurants	Refusal: 7th April
11. Liberty ICD	Manufacture of made-up textile articles	Operation not started as of 22nd May
12. Smile Communications	Transport, Storage & Communications	Refusal: 15th May
13. Alcatel East Africa	Transport, Storage & Communications	Refusal: 13th May
14. Spiceland	-	Inaccessible as of 13th May
15. Busingye Properties	-	Inaccessible as of 20th May
16. Norvik Enterprise	-	Refusal: 18th June
17. Mt Elgon Seed Co.	Agriculture Business Activities	Does not apply
18. Entity Uganda	-	Inaccessible as of 9th April
19. Wash And Wills Limited Country Home	-	Inaccessible as of 18th May
20. Orwell International Oil & Gas	-	Inaccessible as of 5th May

21. Next Trading	-	Inaccessible as of 13th April
22. Al-Heelam Clearing & Forwarding	-	Inaccessible as of 4th April
23. Back Up International Uganda	-	Inaccessible as of 23rd April
24. Shivan Industries	-	Inaccessible as of 15th April
25. Khalsa Developments	-	Missing Location
26. Ali Motors Uganda	-	Missing Location
27. Shoe Warehouse	-	Inaccessible as of 13th May

Source: Author's compilation based on the on-site interviews, 2015.

Table A6.3
Summary of respondents involved in the discussion of the on-site interviews

Name	*Job title*	*Gender*	*Firm's country origin*	*Ownership status*
Mr. Tom Nicolas	Operations Director	M	Uganda	Domestic
Mr. Abdulh Ali	Director	M	UK	Foreign
Mr. Solomon	General Manager	M	Uganda	Domestic
Mrs. Mebo	General Manager	F	Uganda	Domestic
Mr. Dipak Prajapati	Accountant	M	India	Foreign
Mr. Gurmeet	Financial Controller	M	Uganda	Domestic
Mrs. Morin	Executive Secretary	F	UK	Foreign
Mr. David Katende	Managing Director	M	Uganda	Domestic
Mr. Alok Badoni	Director	M	India	Foreign
Mrs. Margaret Odaka	Managing Director	F	Uganda	Domestic
Anonymous	Managing Director	M	Denmark	Foreign
Mr. Nicodemus Muendo	Director	M	Kenya	Foreign
Mr. Ssekajja John	Accountant	M	UK	Foreign
Anonymous	Director	M	Uganda	Domestic
Mr. Dharmesh V. Patel	Managing Director	M	India	Foreign
Mr. David Lukakamwa	Managing Director	M	Uganda	Domestic
Anonymous	Operation Manager	M	Kenya	Foreign
Mr. Amit Patel	General Manager	M	India	Foreign
Mr. James Okeny	Managing Director	M	Uganda	Domestic
Anonymous	Managing Director	M	Uganda	Domestic
Mr. Abdu-Rahman Wasige	Accountant	M	Uganda	Domestic
Mr. Habib G. Dodhiya	General Manager	M	India	Foreign
Mr. Vin	General Manager	M	Uganda	Domestic
Mr. Jasper Sekitoleko	Director	M	Uganda	Domestic
Mr. Tanaji Suravase	Marketing Manager	M	India	Foreign
Mr. Prashant Gupta	Country Manager	M	Kenya	Foreign
Mr. Allan Kibirige	Operation Manager	M	Uganda	Domestic
Mr. Bruhad Patel	Director	M	India	Foreign
Mr. Abdul Kareem Ali	Operation Manager	M	Germany	Foreign
Mr. Manish Patel	General Manager	M	Uganda	Domestic
Miss Amanya Daphen	Senior Accountant	F	Uganda	Domestic
Dr. Nkurunziza Emmanuel	Managing Director	M	Uganda	Domestic
Mr. R. Santosh	Manager	M	India	Foreign

Source: Author's compilation based on the on-site interviews, 2015.

Table A6.4
Interview guide addressed to the surveyed domestic firms

- What are your main responsibilities in your firm?
- What are the main business activities of your firm?
- What are the characteristics of your firm: its demographics (small vs. large firms, startups vs. incumbents), employment pattern (female vs. male), market orientation (domestic market oriented vs foreign market oriented), ownership structure (male-owned vs. female-owned), technological levels vis-à-vis foreign firms in the sector?
- Has your firm benefited from the presence of foreign-owned firms in the sector? If yes how has it benefited? If no, why have spillover effects failed to emerge?
- Has your firm benefited from technological transfer from the presence of foreign-owned firms in the sector via demonstration of new products and processes as well as business contacts?
- Has your firm benefited with an increase of export by imitating the process of the foreign affiliates, or entering/penetrating export markets?
- Has your firm hired local workers who previously worked for or have been trained by foreign affiliates? If yes, how many and which kinds of domestic employees? Has your firm benefited from the experience and knowledge acquired in the foreign affiliates? Could you describe how the benefit has accrued?
- Was the owner of your firm trained by foreign affiliates or gained experience in the foreign firms in the sector before the setup of his/her own firm?
- Do you have an employee training policy (why/why not?). How are employees trained?
- Has your firm benefited from increased competition resulting from the presence of foreign-owned firms? Has increased competition forced your firm to use existing and resources more efficiently or introduce new technology? How has your firm maintained its market power and been able to survive with foreign competition?
- Which transmission channel(s), do you think tend(s) to maximize your company's benefits from foreign affiliates? How important in your view are the transmission channels for creating spillovers?
- Which aspect of firm characteristics (in terms of the heterogeneity explained previously) do you think affect the benefit from the foreign presence?

Table A6.5
Interview guide addressed to the surveyed foreign firms

- What are your main responsibilities in your firm?
- What are the main activities of your firm and the ownership share?
- What were the main drivers to choose this country/region for setting up your establishment? When and how did you enter this country and region? Has your firm benefited from choosing this location (for instance, in terms of competitive environment, attractive tax system, quality infrastructure, better product market etc)?
- Has your firm benefited from technology transfer from its presence in this country and region via demonstration of new products and processes provided by domestic or other foreign firms as well as business contacts?
- Has your firm benefited from the increase of export by imitating the exporting process of domestic or other foreign affiliates?
- Number of employees at the establishment. Has your firm hired local workers? What kind of employees does your firm hire (such as supervisor, simple manufacturing operative, technically advanced professional, top-level managers), and how often/many per year? Are they qualified? Are they offered or do they need any training? Do you have an employee training policy? What is the motivation for the employee training policy?
- Do domestic employees in your firm leave after receiving training or working for a short while? How often/many per year and how does this affect the performance your firm?
- Has your firm benefited from competition with domestic firms in the sector? Could you describe how the benefit appeared or was realized?

Figure A6.1
Research approval letter from UNCST

Uganda National Council for Science and Technology
(Established by Act of Parliament of the Republic of Uganda)

UNCST

12 March 2015

Our Ref: SS 3711

Mr. Binyam A. Demena
Ministry of Finance, Planning & Economic Development
Kampala

Re: Research Approval: **Foreign Direct Investment, Spillovers and Firm Heterogeneity in Sub-Saharan Africa**

I am pleased to inform you that on **09/02/2015**, the Uganda National Council for Science and Technology (UNCST) approved the above referenced research project. The Approval of the research project is for the period of **09/02/2015** to **09/01/2016.**

Your research registration number with the UNCST is **SS 3711**. Please, cite this number in all your future correspondences with UNCST in respect of the above research project.

As Principal Investigator of the research project, you are responsible for fulfilling the following requirements of approval:

1. All co-investigators must be kept informed of the status of the research.
2. Changes, amendments, and addenda to the research protocol or the consent form (where applicable) must be submitted to the designated local Institutional Review Committee (IRC) or Lead Agency for re-review and approval **prior** to the activation of the changes. UNCST must be notified of the approved changes within five working days.
3. For clinical trials, all serious adverse events must be reported promptly to the designated local IRC for review with copies to the National Drug Authority.
4. Unanticipated problems involving risks to research subjects/participants or other must be reported promptly to the UNCST. New information that becomes available which could change the risk/benefit ratio must be submitted promptly for UNCST review.
5. Only approved study procedures are to be implemented. The UNCST may conduct impromptu audits of all study records.
6. A progress report must be submitted electronically to UNCST within four weeks after every 12 months. Failure to do so may result in termination of the research project.

Below is a list of documents approved with this application:

	Document Title	Language	Version	Version Date
1	Research Proposal	English	N/A	Jan 2014

Yours sincerely,

Leah N Omongo
for: Executive Secretary
UGANDA NATIONAL COUNCIL FOR SCIENCE AND TECHNOLOGY

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Figure A6.2
Photo Narration - Perfect Binder Printer

Source: Fieldwork, 2015.

Figure A6.3
Photo Narration - Computerized Paint Colour Dispenser

Source: Fieldwork, 2015.

Figure A6.4
Photo Narration - Computerized Embroidery

Source: Fieldwork, 2015.

Figure A6.5
Photo Narration - agglomeration of publishing, printing and reproduction of recoded media

Source: Fieldwork, 2015.

Source: Fieldwork, 2015.

Figure A6.6
Photo Narration - manufacture of machinery and equipment

Source: Fieldwork, 2015.

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