

## Technology-Driven Foreign Direct Investment within the Global South

CRISTINA CHAMINADE, Lund University, Sweden

LUCÍA GÓMEZ, Turku University, Finland

South–South technology investments can be important for the development of the Global South because they can have advantages over the (more conventional) North–South investments. As recently argued in academic literature, the technology distance between the countries in South–South investments is potentially lower, thus facilitating the assimilation of the technology by the host country and enabling higher degrees of novelty.<sup>1</sup> The last decade has seen a proliferation of anecdotal evidence indicating that a gradual change is taking place in the predominant paradigm of innovation: emerging economies are now playing a much more prominent role in the international flows of research and development (R&D).

However, knowledge about technology-related investments in the Global South has been very limited, partly because technology-driven foreign direct investment (TFDI) from the Global South is a relatively new phenomenon, partly because it is still a very marginal phenomenon, and partly because global data on technology-related investments were scarce. This chapter aims to move from anecdotal evidence to worldwide data to investigate the importance of international flows of R&D to, and particularly within, the Global South.<sup>2</sup>

Data on the number of foreign direct investments announced during the period 2003–14 as recorded in the fDi Markets database are used in this investigation. The fDi Markets is an online database maintained by the Financial Times; it collects information on all greenfield investment projects announced in publicly available information sources.<sup>3</sup> These data are the main data source for the United Nations Conference on Trade and Development (UNCTAD)'s *World Investment Report*.

The fDi Markets data trace the changes in cross-border greenfield investment projects by looking at the countries of origin and destination as well as the nature of the investment (manufacturing versus technology-driven investments).<sup>4</sup> This chapter follows Chaminade (2015) in defining 'technology-driven foreign direct investments (TFDI)' as including investments that are classified in fDi Markets as R&D; design, development, and testing (DDT); technology support centres; and information and communication technologies (ICTs) and infrastructure.

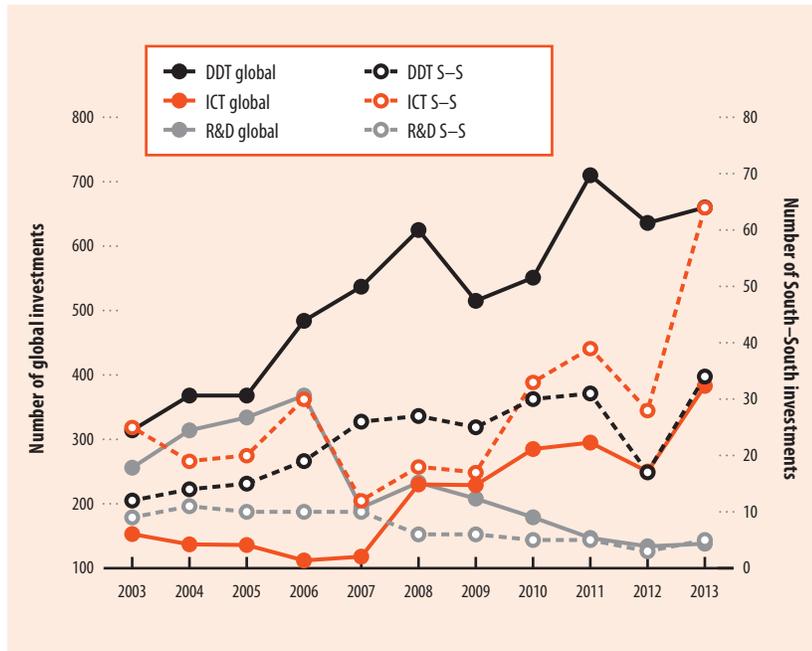
This chapter is structured as follows. First a condensed review of the literature on the effects of TFDI is provided to try to answer the question of why TFDI is important for

development and why South–South TFDI would be particularly relevant for the growth and transformation of the Global South. Second, the chapter provides a summary of the general trends in TFDI worldwide, followed by a general overview of South–South TFDI. The data reveal that (1) TFDI South–South is a very marginal phenomenon; (2) it is clearly dominated by investments in ICTs; (3) it generally follows the same patterns as global TFDI; (4) important regional differences exist in the nature and geographical scope of the investments; and (5) it is driven by a handful of players who are active in many regions of the Global South. Finally, the chapter discusses the implications of some of the findings, particularly related to the critical role that multinationals from the Global South or emerging market multinationals (EMNEs) can play in bridging the technological gap between North and South.

### The importance of South–South TFDI for development

The impact of foreign direct investment (FDI) on firms and home regions has been largely studied in the international business literature. The main conclusion of this stream of literature is that FDI tends to have positive effects on firm productivity

We would like to thank Professor Balaji Parthasarathy (IIITB-Bangalore, India) and Manuel Gonzalo (National University of General Sarmiento, Argentina) for providing us with examples of South–South TFDI. Similarly, our gratitude goes to Professor Davide Castellani and Professor Ronald Wall for the data on cross-border technology-driven investments.

**Figure 1: Evolution of number of technology-related investments, 2003–13**

Source: Authors' elaboration, based on FDI Markets database.

Note: Global data are shown on the left axis and the solid lines; South–South data are shown on the right axis with dotted lines. The authors are particularly grateful to Davide Castellani for providing the data for this graph.

because it lowers costs, while it has a negative effect on the productivity and growth of the home region because of its hollowing out effects. However, the final positive effect on the firm or the potential negative effect on the home region is contingent on a variety of factors, notably the absorptive capacity of the firm.

TFDI is a special case of FDI that has been much less studied. In contrast with general FDI, existing evidence of the impact of TFDI points to its potential positive influence for both the firm and the home region. R&D offshoring can improve overall firm R&D efficiency;<sup>5</sup> it does this by reducing costs and acquiring complementary knowledge needed for innovation.<sup>6</sup> At the same time, TFDI is associated with significantly higher productivity growth in the home region than pure offshoring in manufacturing,<sup>7</sup> as well as with increased innovation capabilities

in the host region.<sup>8</sup> However, the positive impacts are not automatic and will ultimately depend on a variety of factors such as the degree of autonomy of the subsidiary;<sup>9</sup> the absorptive capacity and international experience of the firm;<sup>10</sup> the presence of innovation-complementary assets in the host region;<sup>11</sup> and, more generally, the institutional distance between the host and the home countries.<sup>12</sup>

A critical question is whether the same pattern can be observed for technology-driven investments by multinationals from the Global South—that is, emerging-market multinationals (EMNEs). The literature on the technology-driven investments of EMNEs is far less prolific and much more recent, and its impact is still being researched. In a recent article, Awate et al. (2014) compare the R&D internationalization processes of a multinational

from a developed country with that of an EMNE. They conclude that the investments of the multinational from the North are made for competence exploitation to undertake adaptations or to realize cost advantages, and that the R&D conducted in the headquarters is the main knowledge source of the subsidiary. In contrast, EMNEs use their technology investments abroad to acquire knowledge and catch up, while the technological level of their headquarters is usually lower than that of the subsidiary.<sup>13</sup> Minin and Zhang (2010), however, reach different conclusions when looking at Chinese investments abroad. They find that multinationals from the South use different strategies according to different learning goals, and that some investments had the clear purpose of exploiting technologies developed elsewhere (in either a developed or a developing country) rather than acquiring knowledge.

The extent to which these EMNEs can benefit from the R&D and other technology-related investments abroad depends largely on their absorptive capacity and previous experience;<sup>14</sup> in this respect, there are no significant differences with MNCs from the North. However, some of the limitations of technology spillovers derived from the greater technology distance between host and home countries in North–South investments can partially disappear in South–South investments: the technology distance between the countries is shorter, facilitating the assimilation of the technology by the host country,<sup>15</sup> and achieving higher degrees of novelty.<sup>16</sup> Furthermore, EMNEs seem to have a comparative advantage with respect to their counterparts in the North: they tend to perform better in institutionally different environments than multinationals from the North or, in other

words, the institutional distance seems to matter less for emerging multinationals.<sup>17</sup>

In sum, TFDI is generally associated with positive impacts for the firm and the host region. However, its final impact depends on a variety of factors, including the degree of autonomy of the subsidiary, the absorptive capacity of the firm, its previous international experience, and the institutional distance. The same factors seem to play a role in the R&D FDI of EMNEs with one exception—they may be better endowed to deal with institutional distance. This is an aspect that will be further discussed later in this chapter.

### Global trends in TFDI

Using the data from fDi Markets from 2003 to 2013 and considering the number of investments by destination worldwide, Castelli and Castellani (2013) clearly identify that the most important destinations of technology-related projects, both for applied research (DDT) and basic research (R&D), were precisely two countries in the Global South: China and India. In the period indicated, China received nearly 17% of all the R&D cross-border investments and 12.8% of all DDT investment projects, while India was the recipient of 14.7% of the R&D and 20.3% of the DDT investment projects.<sup>18</sup>

However, the investment growth rate in those two countries for TFDI has not been steadily growing over the considered period: the number of TFDI projects towards China had dropped 2.3% and towards India had dropped 7.3% by 2012.<sup>19</sup> Interestingly, the data show that the decline in TFDI projects towards China and India has occurred in parallel with an increase in TFDIs from China and India, including to the

Global South, as will be discussed in the next section.

A critical question is whether the observed decline reflects a decreasing importance of the Global South, particularly of China and India as countries of destination of TFDI, or is the result of a general decline in the number of TFDI projects as a whole. As can be observed in Figure 1, which compares the trends in R&D, DDT, and ICT investments worldwide with their South–South counterparts, the general trend has been a decline in the number of R&D investments (dotted grey line) while the number of DDT- and ICT-related investments shows an increase over the same period.

The graph clearly points out the relative importance of TFDI South–South with respect to the total number of technology related investments globally: generally only 10% of the total TFDI is South–South. In other words, TFDI in the Global South is still a rather marginal phenomenon. Most of the EMNEs that invest in technology tend to go North, probably for asset seeking, as predicted in the literature.<sup>20</sup>

Figure 1 also shows that South–South TFDI shows a general pattern over time similar to that of global TFDI. The clear exceptions here are the investments in ICTs, which exhibit a growth rate markedly higher in the Global South (although the number of projects is still much lower). This result is rather surprising—the ICT industry has gradually moved to the South;<sup>21</sup> in fact, some of the most important hubs in the ICT industry are now located in the Global South,<sup>22</sup> and some of the most important global actors are also located there.<sup>23</sup> The implications are important. ICTs comprise important enabling technologies and their dissemination and widespread use in the Global South

(as discussed in previous GII reports) can enable growth and development through new products, new services, new business models, better information, and so on. This is very important for less-developed regions in the Global South, including many African countries, as discussed next.

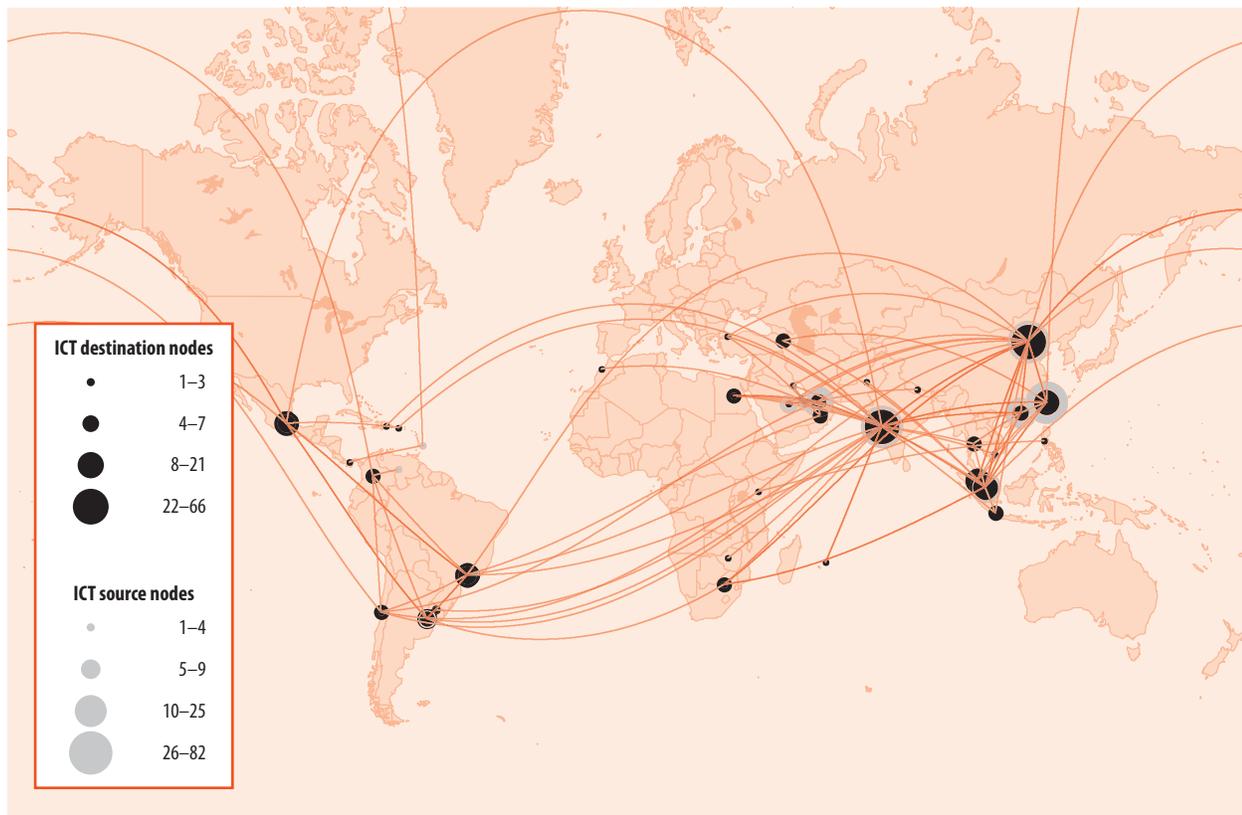
### South–South investments: Geographical patterns

The geographical patterns in South–South TFDI can be useful in assessing the actual extent and nature of the phenomenon and their implications for development. The first step in this process is to determine just what patterns and main players are evident from the data. This section looks first at general patterns, and then considers details of those patterns for different regions.

#### Geographical patterns

Figure 1 shows that the majority of South–South TFDI projects are related to ICTs (47% of total South–South TFDI) and DDT (36%). Purely R&D investments comprise only 10% of the total, while technical support centres are just 7%. Taken together, the total number of South–South TFDI grew at a 14% rate between 2003 and 2014. DDT and ICTs were the predominant activities. R&D and technology support centres decreased or were scarce in most of the Southern world regions.

The Southern world region receiving the highest number of inward TFDIs from the Global South was Asia (51%). However, the number of overall investments in this region has remained almost the same for the whole period, with a growth rate of 1%. In contrast, investments to Africa and Latin America and the Caribbean grew at a much faster rate: 15% and 14%, respectively, almost

**Figure 2: Geography of cross-border investments in DDT within the Global South, 2003–14**

Source: Authors' elaboration, based on FDI Markets database.

catching up with the number of investments to Asia. In fact, during 2014 Africa got more TFDIs than any other Southern world region.

Outward TFDIs grew from all regions during the considered period, but especially from Africa at a rate of 20% and Latin America and the Caribbean at 14%. This growth is mainly the result of flows between countries within the same world region, as will be discussed next. Latin America and the Caribbean is the extreme case, with only 4% of outward investments going to other Southern world regions. Two figures illustrate the geography of the South–South TFDIs: Figure 2 shows South–South DDT investments, while Figure 3 shows South–South ICT investments.

### *Africa*

TFDI in Africa is almost exclusively related to ICTs: investments in ICTs represented 80% of all TFDI projects in the region.<sup>24</sup> Furthermore, these investments grew at a very high rate between 2003 and 2014—22%—reaching their peak in 2013. Notably, half of these investments came from within Africa (90% of all ICT investments originating in Africa remained in Africa), particularly from Mauritius and South Africa—which, not surprisingly, are also ranked 1st and 2nd, respectively, for Sub-Saharan African countries in the 2015 Global Innovation Index.

In contrast with the other regions, Africa has few DDT investments, instead playing a prominent role in the network of South–South technology support centre

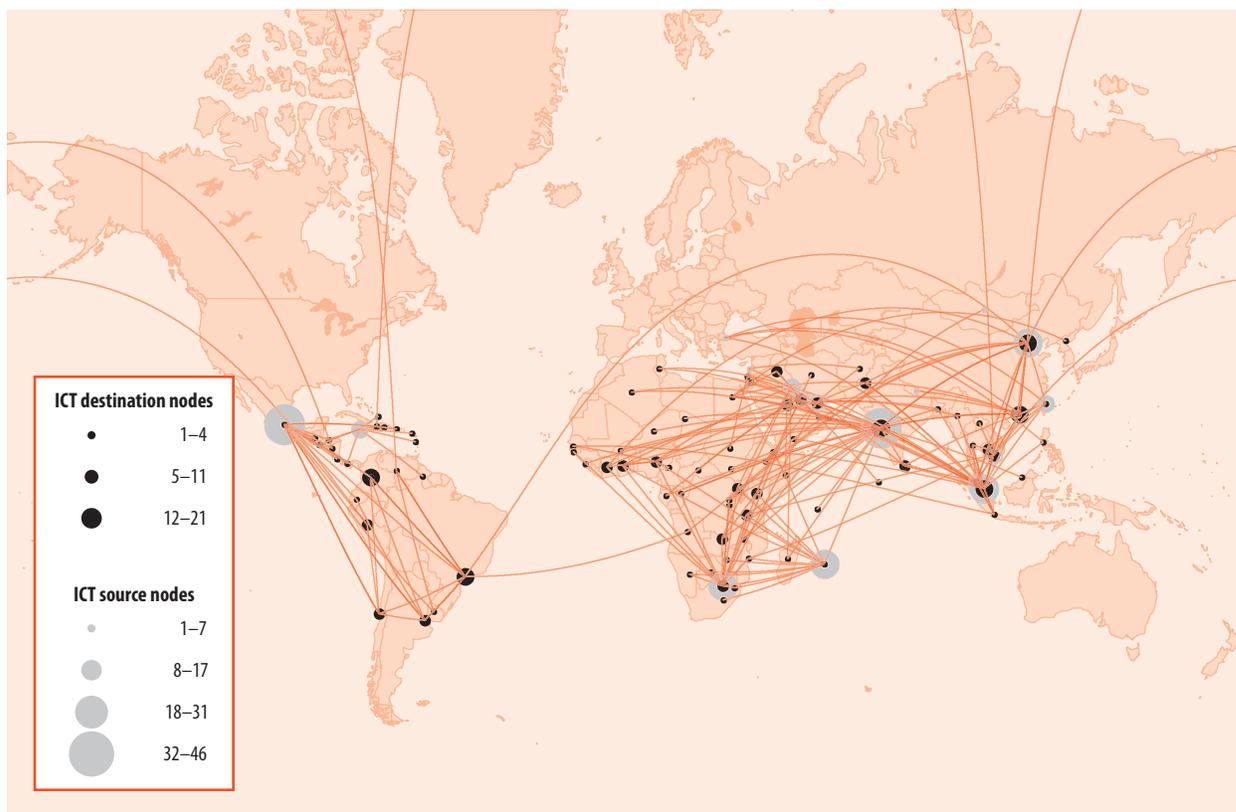
investments. Kenya is a major origin node of investment flows, together with India and China. All of Kenya's investments were made outside Africa, towards Asia and Latin America and the Caribbean. Kenya's investment source is just one company—Comcraft group—which has a network of subsidiaries in five countries, primarily in software and information technology services.

### *Latin America and the Caribbean*

South–South TFDI to Latin America and the Caribbean is characterized by high volatility and discontinuity.<sup>25</sup> DDT and ICTs account for 90% of all Latin American and the Caribbean TFDI.

For the period 2003–14, DDT is the region's fastest-growing TFDI activity, with a growth rate of 17%.

Figure 3: Geography of cross-border investments in ICTs within the Global South, 2003–14



Source: Authors' elaboration, based on fDi Markets database.

About 60% of DDT investments to Latin America and the Caribbean came from Asia, 36% from within Latin America and the Caribbean; only 2% came from Africa and 2% from the Middle East. From Asia, investments came mainly from India, with investments in software and information technology services in Latin America and the Caribbean since 2003; and from China, with more recent investments (since 2010) in communications. Intra-regional DDT investments originate primarily from Argentina, Brazil, Chile, and Mexico, with the biggest destination nodes in Brazil and Mexico. These investments were mainly in software and information technology services-related projects.

The biggest TFDI activity in Latin America and the Caribbean is

in ICTs. However, the growth rate of ICT investments between 2003 and 2014 is a bit slower (12%) than that of DDT investments. Most ICT investments in the region (90%) came from within Latin America and the Caribbean. The biggest origin of these investments was Mexico (the origin of half of all ICT investments); the main destinations were Brazil and Colombia.

*The Middle East*

The Middle East was the world region with the fewest South–South TFDI projects,<sup>26</sup> and no clear trend could be identified for any of the TFDI activities during the whole period. Particular to TFDI to the Middle East, when compared with the other Southern world regions, was the wider range of industry

sectors that it included (ICTs, metals, automotive, and life sciences).

Relevant aspects of TFDIs originating in the Middle East were the prominence of investments related to life sciences and the number of ICT investments destined for Africa (37%), which was equal to the number of investments remaining in the Middle East.

*Asia*

The number of South–South TFDIs to Asia grew at a slower rate, 1%, than that of other world regions.<sup>27</sup> This means that DDT, technology support centres, and ICT investments grew at a rate of 3% and R&D dropped at a 14% rate.

Despite this drop, Asia still dominates the investment scene for R&D in the Global South. Eighty percent

**Table 1: Most important investors in TFDI within the Global South**

Region	Description	Main companies for outward TFDI (headquarter country, main activity, number of investments)	Main companies for inward TFDI (headquarter country, main activity, number of investments) <sup>a</sup>
<b>Africa</b>	ICT investments are by far the most important investments in the region. South Africa, Kenya, and Mauritius are the most important origins of outward investments, which tend to have another African country as their destination. Strong intra-region TFDI is evident.	<ul style="list-style-type: none"> <li>• MTN group (South Africa, ICTs, 16)</li> <li>• Comcraft Group (Kenya, technology support centres, 12)</li> <li>• Seacom (Mauritius, ICTs, 10)</li> <li>• Altech Group (South Africa, ICTs, 6)</li> <li>• Liquid Telecom (Mauritius, ICTs, 6)</li> </ul>	<ul style="list-style-type: none"> <li>• Bharti Group (India, ICTs, 17)</li> <li>• Seacom (Mauritius, ICTs, 10)</li> <li>• Tech Mahindra (India, technology support centres, 7)</li> <li>• Altech Group (South Africa, ICTs, 6)</li> <li>• Liquid Telecom (Mauritius, ICTs, 6)</li> </ul>
<b>Latin America and the Caribbean</b>	DDT investments occur mostly within the region, but not exclusively. Investments are also made in South Africa, the Middle East, and China. Interestingly, ICT investments from a Latin American and the Caribbean company go exclusively to other Latin American and the Caribbean countries. Firms from Mexico, Argentina, and Bermuda are the most important origins of investments from the region.	<ul style="list-style-type: none"> <li>• América Móvil (Mexico, ICTs, 32)</li> <li>• Digicel (Bermuda, ICTs, 10)</li> <li>• TelMex (Mexico, ICTs, 9)</li> <li>• Grupo Assa (Argentina, DDT, 5)</li> <li>• Globalfono (Argentina, ICTs, 4)</li> </ul>	<ul style="list-style-type: none"> <li>• América Móvil (Mexico, ICTs, 19)</li> <li>• Digicel (Bermuda, ICTs, 9)</li> <li>• TelMex (Mexico, ICTs, 8)</li> <li>• Grupo Assa (Argentina, DDT, 5)</li> <li>• Huawei technologies (China, DDT, 4)</li> <li>• TCS (India, DDT, 4)</li> </ul>
<b>Middle East</b>	Although there is an extensive network of investments within the region, there is also a clear international focus, with DDT investments to Chile, northern Africa, India, and China. ICT investments are much more extended geographically, including to central and north African countries and to Asia.	<ul style="list-style-type: none"> <li>• Zain (Kuwait, ICTs, 14)</li> <li>• Etisalat (UAE, ICTs, 9)</li> <li>• Partners &amp; Partners (Qatar, DDT, 7)</li> <li>• Ooredoo (Qatar, ICTs, 6)</li> <li>• SABIC (Saudi Arabia, DDT, 5)</li> </ul>	<ul style="list-style-type: none"> <li>• Star Metropolis (UAE, R&amp;D, 6)</li> <li>• Qatar Heart Laboratory Holding (Qatar, DDT, 4)</li> <li>• Huawei Technologies (China, technology support centres, 3)</li> <li>• Eastern Biotech &amp; Life Sciences (UAE, DDT, 2)</li> </ul>
<b>Asia</b>	Companies headquartered in Asia are by far the most active in TFDI and the ones with the most global scope (with DDT and ICT investments in Latin America and the Caribbean, Africa, the Middle East, and Asia).	<ul style="list-style-type: none"> <li>• Bharti Group (India, ICTs, 24)</li> <li>• Huawei Technologies (China, DDT, 14)</li> <li>• Tata Group (India, DDT, 11)</li> <li>• Metropolis Health Services Group (India, R&amp;D, 10)</li> </ul>	<ul style="list-style-type: none"> <li>• Mahindra Satyam Computer Service (India, ICTs, 9)</li> <li>• PacNet international (Singapore, ICTs, 9)</li> <li>• Media Tek (Taiwan, Province of China, DDT, 8)</li> </ul>

Source: Authors' elaboration, based on fDi Markets database.

<sup>a</sup> 'Inward' is at the level of the country, not the region. That is, a South African company that invests in Kenya would be classified as inward FDI in Kenya and outward in South Africa.

of all South–South R&D flows took place within the Asian region. The main origin of investments was India, and the main destination was China. R&D investments were mainly in the communications and pharmaceutical sectors.

Considering the whole period, DDT has been the predominant TFDI activity in Asia for South–South investments. Asia was the origin for 76% of DDT investment flows and the destination for 65% of them; most investments had China or India as either their origin or destination.

Investments in ICTs in the region rose quickly after 2011, so by the end of the period this sector was receiving

the most South–South TFDI in the Global South. Moreover, the number of ICT investments in 2014 was twice that of 2013. India, Singapore, and China were the main origins of investment flows; their main destinations were in Asia (76%) and Africa (23%).

India and China are, therefore, not only the most important destination of cross-border TFDI projects globally but also the most important source of TFDIs to the Global South, particularly DDT and ICTs. The nature of the investments suggest that EMNEs from China and India follow predominantly an asset exploiting strategy—that is, these investments are more closely related

to the development and adaptation of products to particular markets that have been developed somewhere else. An intriguing question worth investigating in the future is whether Chinese and Indian multinationals may be acting as gatekeepers of technology from the North to the South, as technology intermediaries.

### Main players

Data from fDi Markets allow identification of the companies responsible for the investments, their main sector of activity, the number of their investments, and their nature as well as their destination. Table 1 shows the main players in TFDI within the Global South. The presence of

**Box 1: Company views on the potential benefits of South–South TFDI**

Four examples from companies from three different Southern world regions are presented here to illustrate different characteristics of the potential benefit impact, for both home and host countries, of South–South TFDI to product innovation. See also Table 1.

**Huawei Technologies** opened its first research and development (R&D) centre outside China in Bangalore, India, in 1999.<sup>1</sup> The R&D centre in Bangalore has been the source of some innovative solutions that later were commercialized worldwide. A prime example of innovative solutions developed at its Bangalore centre is the single-RAN (radio access network) launched in 2006. This network enabled the telecommunication operators to ‘graft’ the latest technologies—such as a 3G or an LTE (long-term evolution) service—onto their networks. Another product being developed at the Bangalore centre, which has already been launched in Latin America and the Caribbean, is the technology that enables Voice over LTE. These and many other examples highlight the key role the Indian subsidiary is playing in the innovation strategy of Huawei. This has also led the Chinese giant to further invest US\$170 million in R&D in India in 2015, as has been announced in

the press.<sup>2</sup> This case underlines the importance of South–South TFDI where both the host and the home countries benefit from each other. Although China leveraged the Indian pool of engineering talent and expertise to increase its global presence, India managed to attract investment in R&D and to engage its workforce to develop cutting-edge technology.

**ZTE Corporation** is a Chinese multinational telecommunications equipment and systems manufacturer, headquartered in Shenzhen, China, founded in 1985.<sup>3</sup> ZTE has an R&D unit in Bangalore, India, in which the company has invested approximately US\$40 million in the second half of the last decade.<sup>4</sup> ZTE India’s R&D enables it to tap into Bangalore’s world-class expertise in software.<sup>5</sup> The Bangalore unit develops a range of telecommunication software applications in the mobile value-added service (VAS) space such as caller ring-back tones, call centre applications, and billing solutions.<sup>6</sup> The investment in India for R&D accounts for 10% to 15% of the total global R&D spend of ZTE.<sup>7</sup>

**Globant** is an Argentina-based information technology and software development company with four investments in

Latin America, including a DDT investment in Uruguay. The investments in Uruguay are considered to be crucial to the development of innovative software products for the company.<sup>8</sup>

**Seacom**, an ICT company headquartered in Mauritius, is behind some of the largest investments in ICTs in Africa, such as the instalment of the first undersea fibre optics cable along the east coast of Africa. The Internet cable is believed to have had a major impact on the business environment, for example in Nairobi, Kenya, by cutting the costs of Internet access by 120% while increasing access by a factor of 100.<sup>9</sup>

**Notes**

- 1 Fu, 2015.
- 2 Sen, 2013.
- 3 Fu, 2015.
- 4 live mint, 2010.
- 5 Chaminade and Vang, 2008.
- 6 Parbat, 2012.
- 7 live mint, 2010.
- 8 Gonzalo et al., 2013.
- 9 Turak, 2016.

the same firm as both inward and outward FDI indicates that the largest majority of investments are inside the region. Furthermore it is possible to see that the majority of the South–South TFDI is in the hands of a handful of EMNEs, many of which belong to large business groups.<sup>28</sup> That is the case for the Indian Bharti Group, Tech Mahindra, and the Tata Group, as well as the Chinese Huawei and ZTE. The most dominant players in Latin America and the Caribbean are América Móvil, Digicel, TelMex, and Grupo Assa, while Seacom, Altech, and Liquid

Telecom are the corresponding African ones.

**Towards a win-win strategy**

The low number of EMNEs conducting TFDI in the Global South significantly limits the ability to draw evidence-based conclusions about the benefits of South–South TFDI for both the host and the home countries beyond what was discussed in the second section of this chapter. This limitation is particularly evident with regard to long-term benefits such as upgrading skills and building up innovation capabilities,

since South–South TFDI is still in its infancy. However, anecdotal evidence collected from company websites and local newspapers suggests that a win–win strategy is possible, with potential benefits both from the host and the home economies in line with what the literature suggests. Box 1 provides some examples of perceived benefits of South–South TFDI in R&D, DDT, and ICTs and in different regions of the Global South.

Asset creation strategies by EMNEs may provide access to specialized and complementary knowledge—such as software capabilities

for ICT telecommunication equipment manufacturers—thus enabling the development of new products and services. Those innovations can subsequently be exploited in a variety of countries, including other countries in the Global South, thus generating economies of scale and further spillovers. An example of this is seen in the Huawei Voice over LTE, developed in Bangalore and commercialized in Latin America and the Caribbean and Europe; see Box 1). Innovations developed in the South and for the South may be able to better address the needs of developing countries and may thus provide EMNEs with a comparative advantage over the MNEs from the North. Additionally, these cases suggest that TFDI may lead to an upgrading of skills in the host country (like Huawei in Bangalore).

ICT-related investments—especially those related to ICT infrastructure, which characterize the lion's share of TFDIs into Africa and Latin America and the Caribbean—can also have a significant impact on the host country. ICTs and their development potential in developing countries are generally analysed from three different perspectives.<sup>29</sup> First, host countries can catch up to advanced economies and improve both their competitiveness capabilities and those of local business organizations in global markets. ICT investments are considered to impact the skills and productivity of labour as well as to generate more rapid and long-run economic growth.<sup>30</sup> Second, both host countries and home countries see the emergence of new ICT-based business models, expanding their information bases and lowering the cost of access to information. And third, the impact of ICTs is evident as they transform socioeconomic conditions through governments going digital in host

countries, thus improving social services delivery, increasing democratic participation, and improving access to public services.<sup>31</sup>

In sum, the analysis of South–South TFDI investments using fDi Markets data reveals that, although South–South TFDI is in its infancy, it is generally growing and is clearly dominated by investments in ICTs. Although the limited number of investments prevents the drawing of conclusions on their impact, particularly in the long term, anecdotal evidence suggests that a win-win strategy is possible. This strategy has a positive impact both in the host and home countries in the form of access to complementary knowledge, better fit of technological solutions to specific development challenges, economies of scale, development of skills and capabilities and basic ICT infrastructure; these in turn can impact development trajectories. However, grasping the potential benefits is not automatic and will depend on a variety of factors, such as the absorptive capacity and international experience of the firm, the presence of a dynamic innovation environment in the host country, and, more generally, the institutional distance between the host and the home countries.

### Notes

- 1 For a discussion of the assimilation of technology by the host country, see Amighini and Sanfilippo, 2014; for a discussion of higher degrees of novelty, see Harirchi and Chaminade, 2014.
- 2 The 'Global South' is hereby defined following the Brandt Report (1980) as considering all countries in the Southern hemisphere except Australia, Japan, the Republic of Korea, and New Zealand. The Brandt North–South divide is considered to be not only a geographical but also a socioeconomic and political division.
- 3 Information about the fDi Markets database is available at <http://www.fdimarkets.com/>.

- 4 It is important to stress that the data do not cover other forms of investments, such as mergers and acquisitions, which may be quite important in certain industries.
- 5 Dachs et al., 2012.
- 6 Criscuolo, 2009; Dachs et al., 2012; Ebersberger et al., 2011.
- 7 Castellani and Pieri, 2013.
- 8 Fu, 2008.
- 9 Giuliani et al., 2014.
- 10 Schmiele, 2012.
- 11 Fu, 2008.
- 12 Coe et al., 2009.
- 13 Buckley et al., 2014.
- 14 Buckley et al., 2014; Fu, 2008.
- 15 Amighini and Sanfilippo, 2014.
- 16 Harirchi and Chaminade, 2014.
- 17 Demir and Hu, 2015.
- 18 In the same period, the USA was the recipient of 7.9% of the R&D projects and the same percentage for DDT projects.
- 19 Castelli and Castellani, 2013. The growth trend has not been equal for all types of projects. For example, the number of R&D investments that had China or India as the main country of destination dropped at a rate of –17% for China and –18% for India. At the same time, the number of DDT projects has increased for China at a 4% rate and decreased for India at the same rate, 4%.
- 20 Awate et al., 2014; Buckley et al., 2014.
- 21 Ernst, 2009; Yeung, 2007.
- 22 Chaminade and Vang, 2008.
- 23 Lee and Malerba, 2014.
- 24 African countries involved in South–South TFDI from 2003 to 2014 according to the fDi Markets database include Algeria, Angola, Botswana, Burkina Faso, Burundi, Cameroon, Central African Republic, Chad, Congo, Côte d'Ivoire, Democratic Republic of Congo, Djibouti, Egypt, Ethiopia, Gabon, Gambia, Ghana, Guinea Bissau, Kenya, Lesotho, Madagascar, Malawi, Mauritius, Morocco, Mozambique, Namibia, Niger, Nigeria, Rwanda, Seychelles, Sierra Leone, Somalia, South Africa, South Sudan, Sudan, Swaziland, Tanzania, Tunisia, Uganda, Zambia, and Zimbabwe.
- 25 Latin America and the Caribbean countries involved in South–South TFDI from 2003 to 2014 according to fDi Markets database include Argentina, Barbados, Brazil, Chile, Colombia, Costa Rica, the Dominican Republic, Ecuador, El Salvador, Guadeloupe, Guatemala, Guyana, Haiti, Honduras, Jamaica, Martinique, Mexico, Nicaragua, Panama, Peru, Puerto Rico, Turks and Caicos Islands, Uruguay, and Venezuela.

- 26 The Middle East countries involved in South–South TFDI from 2003 to 2014 according to fDi Markets database include Bahrain, the Islamic Republic of Iran, Iraq, Jordan, Kuwait, Lebanon, Oman, the State of Palestine, Qatar, Saudi Arabia, the United Arab Emirates, and Yemen.
- 27 Asian economies involved in South–South TFDI from 2003 to 2014 according to fDi Markets database include Afghanistan, Armenia, Bangladesh, Brunei, Cambodia, China, Hong Kong (China), India, Indonesia, Lao People's Democratic Republic, Macao (China), Malaysia, Maldives, Mongolia, Myanmar, Nepal, the Democratic People's Republic of Korea, Pakistan, the Philippines, Singapore, Sri Lanka, Taiwan (China), Thailand, and Viet Nam.
- 28 The concentration of investments in a handful of companies can be the consequence of the high costs of FDI in comparison to other mechanisms to access knowledge to innovate—only large firms, mostly part of a larger business group, can afford this form of mechanism to access knowledge.
- 29 Avgerou, 2008.
- 30 See Szirmai, 2012, and World Bank, 2016, for a discussion of more rapid growth; see Pradhan et al., 2015, for a discussion of long-run economic growth.
- 31 UNCTAD, 2015.
- Castelli, C. and D. Castellani. 2013. 'The Internationalisation of R&D: Sectoral and Geographic Patterns of Cross-Border Investments'. *Economia e Politica Industriale* 1: 127–43.
- Chaminade, C., ed. 2015. *Technology-Driven FDI by Emerging Multinationals in Europe*. Lund: Lund University.
- Chaminade, C. and J. Vang. 2008. 'Globalisation of Knowledge Production and Regional Innovation Policy: Supporting Specialized Hubs in the Bangalore Software Industry'. *Research Policy* 37 (10): 1684–96.
- Coe, D. T., E. Helpman, and A. W. Hoffmaister. 2009. 'International R&D Spillovers and Institutions'. *European Economic Review* 53 (7): 723–41.
- Cornell University, INSEAD, and WIPO. 2015. *The Global Innovation Index 2015: Effective Innovation Policies for Development*, eds. S. Dutta, B. Lanvin, and S. Wunsch-Vincent. Ithaca, Fontainebleau, Ithaca, and Geneva: Cornell, INSEAD, and WIPO.
- Criscuolo, P. 2009. 'Inter-Firm Reverse Technology Transfer: The Home Country Effect of R&D Internationalization'. *Industrial and Corporate Change* 18 (5): 869–99.
- Dachs, B., F. Kampik, T. Scherngell, D. Hanzl-Weiss, G. Hunya, N. Foster, S. Leitner, R. Stehrer, and W. Urban. 2012. *Internationalisation of Business Investments in R&D and Analysis of Their Economic Impact*. Brussels: European Commission.
- Demir, F. and C. Hu. 2015. 'Institutional Differences and the Direction of Bilateral Foreign Direct Investment Flows: Are South–South Flows any Different than the Rest?' *The World Economy*. doi: 10.1111/twec.12356.
- Ebersberger, B., S. J. Herstad, E. Iversen, E. Kirner, and O. Som. 2011. *Open Innovation in Europe: Effects, Determinants and Policy*. PRO INNO Europe: INNO-Grips II Report. Brussels: European Commission, DG Enterprise and Industry.
- Ernst, D. 2009. *A New Geography of Knowledge in the Electronics Industry? Asia's Role in Global Innovation Networks*. Honolulu: East-West Center.
- Fu, X. 2008. 'Foreign Direct Investment, Absorptive Capacity and Regional Innovation Capabilities: Evidence from China'. *Oxford Development Studies* 36 (1): 89–110.
- . 2015. *China's Path to Innovation*. Cambridge: Cambridge University Press.
- Giuliani, E., S. Gorgoni, C. Günther, and R. Rabellotti. 2014. 'Emerging versus Advanced Country MNEs Investing in Europe: A Typology Of Subsidiary Global–Local Connections'. *International Business Review* 23 (4): 680–91.
- Gonzalo, M., J. Federico, S. Drucaroff, and H. Kantis. 2013. 'Post-Investment Trajectories of Latin American Young Technology-Based Firms: An Exploratory Study'. *Venture Capital: An International Journal of Entrepreneurial Finance* 15 (2): 115–33.
- Harirchi, G. and C. Chaminade. 2014. 'Exploring the Relation Between the Degree of Novelty of Innovations and User–Producer Interaction Across Different Income Regions'. *World Development* 57: 19–31.
- Lee, K. and F. Malerba. 2014. 'Changes in Industry Leadership and Catch-up by the Latecomers: Toward a Theory of Catch-Up Cycles'. Paper. Available at [http://policydialogue.org/files/events/Keun\\_Kee\\_Paper\\_2.pdf](http://policydialogue.org/files/events/Keun_Kee_Paper_2.pdf).
- live mint. 2010. 'ZTE to Invest Rs200 cr on R&D; Bullish on 3G'. *live mint*, 14 April. Available at <http://www.livemint.com/Companies/zitzAghupw9ykYqac3sswl/ZTE-to-invest-Rs200-cr-on-RampD-bullish-on-3G.html>.
- Minin, A. D. and J. Zhang. 2010. 'An Exploratory Study on International R&D Strategies of Chinese Companies in Europe'. *Review of Policy Research* 27 (4): 433–55.
- Parbat, K. 2012. 'XTE India Scales Down R&D Operations to Cut Costs; Jobs Losses at Bangalore Unit on Cards'. *The Economic Times*, 27 October. Available at [http://articles.economictimes.indiatimes.com/2012-10-27/news/34765204\\_1\\_zte-india-cui-liangjun-zte-corporation](http://articles.economictimes.indiatimes.com/2012-10-27/news/34765204_1_zte-india-cui-liangjun-zte-corporation).
- Pradhan, R. P., M. B. Arvin, and N. R. Norman. 2015. 'The Dynamics of Information and Communications Technologies Infrastructure, Economic Growth, and Financial Development: Evidence from Asian Countries'. *Technology in Society* 42: 135–49.
- Schmiele, A. 2012. 'Drivers for International Innovation Activities in Developed and Emerging Countries'. *The Journal of Technology Transfer* 37 (1): 98–123.
- Sen, S. 2013. 'Chindian Cheer: Chinese Telecom Giant Huawei's Bangalore Research Centre Is Proving a Crucial Resource in its Global Telecom Battle'. *Business Today*, 27 October. Available at <http://www.businesstoday.in/magazine/features/huawei-bangalore-centre-key-role-focus-functioning/story/199114.html>.
- Szirmai, A. 2012. 'Industrialisation as an Engine of Growth in Developing Countries, 1950–2005'. *Structural Change and Economic Dynamics* 23 (2012): 406–20.
- Turak, N. 2016. 'Can Africa Build the ICT Infrastructure it Needs to Fulfil its Potential?' *FDI Intelligence*, 23 February. Available at <http://www.fdiintelligence.com/Locations/Middle-East-Africa/Can-Africa-build-the-ICT-infrastructure-it-needs-to-fulfil-its-potential>.
- UNCTAD (United Nations Conference on Trade and Development). 2015. 'Digital Development'. Report of the Secretary-General. Commission on Science and Technology for Development, Eighteenth Session, Geneva, 4–8 May. Available at [http://unctad.org/meetings/en/SessionalDocuments/ecn162015d2\\_en.pdf](http://unctad.org/meetings/en/SessionalDocuments/ecn162015d2_en.pdf).
- World Bank. 2016. *World Development Report 2016: Digital Dividends*. Washington, DC: World Bank.
- Yeung, H. W.-C. 2007. 'From Followers to Market Leaders: Asian Electronics Firms in the Global Economy'. *Asia Pacific Viewpoint* 48 (1): 1–25.

## References

Amighini, A. and M. Sanfilippo. 2014. 'Impact of South–South FDI and Trade on the Export Upgrading of African Economies'. *World Development* 64: 1–17.

Avgerou, C. 2008. 'Information Systems in Developing Countries: A Critical Research Review'. *Journal of Information Technology* 23: 133–46.

Awate, S., M. Larsen, and R. Mudambi. 2014. 'Accessing vs Sourcing Knowledge: A Comparative Study of R&D Internationalization between Emerging and Advanced Economy Firms'. *Journal of International Business Studies* 46 (1): 63–86.

Brandt, W. 1980. *North-South: A Programme for Survival: The Report of the Independent Commission on International Development Issues*. Cambridge, MA: MIT Press.

Buckley, P. J., S. Elia, and M. Kafourous. 2014. 'Acquisitions by Emerging Market Multinationals: Implications for Firm Performance'. *Journal of World Business* 49 (4): 611–32.

Castellani, D. and F. Pieri. 2013. 'R&D Offshoring and the Productivity Growth of European Regions'. *Research Policy* 42 (9): 1581–94.