



# STIPRO Policy Brief

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## DISTANT NEIGHBOURS

### Foreign Direct Investment (FDI) and local technological capabilities in the mining sector in Tanzania.

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The Science, Technology and Innovation Policy Research Organisation (STIPRO) (formerly ATPS-Tanzania) is an NGO engaged in independent policy research in science, technology and innovation (STI) in Tanzania with a view to informing STI policies in the country. Under the current organizational structure STIPRO acts as a think tank for the network of other individuals and organisations interested in STI policy issues in the country. In 2010-2011, STIPRO carried out a study on the impact of foreign direct investment (FDI) on local technological capabilities in the Mining Sector in Tanzania in order to gauge the extent to which local mining firms were able to use their proximity to foreign mining companies to develop their own technological capacity. The study involved fifty local mining firms in Mwanza and Shinyanga regions.

Foreign Direct Investment (FDI) is a key factor in the economic development of host countries. Among other reasons, they are a channel for international diffusion of technological, organizational and managerial practices thereby building the technological capabilities of local companies. This should, in the long run, lead to higher technological capabilities, and innovation. FDI is thus, an important channel for international diffusion of knowledge and technology and integration of underdeveloped countries into the globalization process, as shown by late entrants into globalised systems such as Malaysia, Mexico and Costa Rica.

In Tanzania, FDI is a relatively new form of investment that took hold from the mid 1980s when the government initiated and implemented deliberate economic liberalization policies. Since then, FDI inflows have been increasing rapidly, particularly in the sectors of manufacturing (33.4%), mining and quarrying (28%) and agriculture (6.7%)<sup>1</sup>.

However, although FDIs have proved very instrumental in building local technological capacities in other countries, very little is known about the impact of FDIs on local technological capabilities here in Tanzania. The few studies that exist look more at intra-firm technology transfer through acquisition of parastatal companies<sup>2</sup> by Multinational Enterprises (MNEs) for example Tanzania Breweries Ltd and Tanzania Cigarette Company Ltd in which technology transfer includes upgrading of production and marketing processes at the acquired firms as a result of the greater technological strengths that foreign investors potentially bring into the acquired company.

1 TIC, BoT and NBS (2004)

2 The concepts Companies, Enterprises, and Firms are used interchangeably.

However, in relation to local firms, the questions that need to be answered are:

- Has increased FDI led to increased technological capabilities of local firms or are they being 'crowded out' by MNEs with their massive technological advantage?
- What policy steps need to be taken to ensure that FDI gives the maximum benefit to Tanzania's technological development?

**Technological capability** is the ability to make effective use of technological knowledge through assimilating and using new technologies, adapting or changing existing technologies and generating new technology. In brief therefore, technological capability can be defined as the ability to innovate at different levels.

Technological innovation capability can be categorized into three broad levels:

- i) Introduction of completely new technology (high)
- ii) Modification of existing technology (midlevel)
- iii) Successful introduction of existing technology into the firm (low)

Technological capability is categorized in three major levels, namely basic, intermediate and advanced and refers to both product and process technologies.

a) Basic:

Product: introduction of minor adaptations to product technology, quality control and maintenance of standards and modification of designs.

Process: minor adaptations of process technology, maintenance of machinery and equipment, introduction of planning and control of production and improved efficiency.

b) Intermediate:

Product: introduce new designs and improve product quality.

Process: Manufacture of components, introduction of automation and selection of technology.

c) Advanced:

Product: Research and development into production of new products or components

Process: Introduction of major improvements to machinery, development of new equipment and production process, introduction of radical innovations.

*How do we ensure FDI is a blessing and not a curse for local firms?*

FDI is believed to be the easiest way to build local technological capabilities in developing countries through transfer of technological, organizational and managerial practices. It is easier for developing countries to attract and build on FDI than to develop local capabilities

independently. As a result, most governments in developing countries have liberalized their economies and removed restrictions on FDI inflows.

However, the positive impact of FDI is not automatic and depends largely on the motives for FDI. FDI may result in negative spillovers if indigenous firms have to close down, as they cannot compete in upgrading their technologies. Furthermore, no spillovers may occur if there are institutional obstacles or insufficient absorptive capacity. Strengthening the positive impact of FDIs on local technological capability requires in-depth knowledge of local conditions and appropriate policies to enhance the positive impacts.

## FDI as a way of developing technological capabilities of local firms

FDI enables technology transfer and associated innovation/technological capability building either directly through linkages or indirectly through spillovers<sup>3</sup>.

### Vertical linkage with buyers and suppliers:

MNEs may benefit the host country through backward and forward linkages. a) Backward linkages are relations with suppliers of parts, components, materials and services. The effect of such linkages on local companies depends on the quantity and quality of inputs supplied and the willingness of MNEs to transfer knowledge and build a long-term relationship with local companies<sup>4</sup>. MNEs can also help to raise the productivity of their suppliers through providing technical assistance or information to raise the quality of the products or to facilitate innovations. Many MNEs train their local suppliers given the importance of quality if exporting to world markets<sup>5</sup>. However, on the negative side, if suppliers are forced to meet higher standards of quality, reliability and frequency and speed of delivery required by the MNE, without any training or assistance, this could lead to them failing to meet the necessary requirements, leading to firm failures and job losses.

MNEs can also contribute through assisting suppliers in purchasing raw materials and intermediary goods, setting up production facilities and diversifying (through finding additional customers), as well as providing training in management and organisation.

b) Forward linkages refer to relations with buyers – either consumers or other firms using the MNEs intermediate products in their own processes. Downstream firms in particular can use higher quality and/or lower priced intermediate goods in their own processes which then benefit consumers through cheaper final products (spillovers).

*Are our policies creating the right linkages?*

However, such linkages are not automatic. They depend on the size of the host market and existing technological capabilities of local suppliers, as well as the quality of local intermediate goods which encourage MNEs to use them. Government can also promote linkage creation through policies requiring a minimum of local content.

### Horizontal linkages through demonstration and competition:

Horizontal linkages refer to the diffusion of technology to competitors of the MNE affiliates, through demonstration or competition. The demonstration effect occurs when local companies see the superior technology of the MNE and therefore update their own<sup>6</sup>, or imitate new technologies used by the MNE. Since most developing countries, are not well integrated into the world economy, technology transfer through demonstration effect is extremely difficult without MNEs operating in their countries.

Demonstration and competition effects reinforce one another. The entry of a MNE encourages

3 Lall, S. and Narula, R (2006): FDI and Its Role in Economic Development: Do we Need a New Agenda? In Narula, R and Lall, S (eds): Understanding FDI – Assisted Economic Development. Routledge, Londres Nueva York, pp. 1– 18, Gachino, G. (2006):

Foreign Direct Investment, Spillovers and Innovations: The Case of Kenya Manufacturing Industry. PhD Thesis, Maastricht

4 UNCTAD (2005), “Improving the Competitiveness of SMEs through Enhancing Productive Capacity”. New York and Geneva.

5 McIntyre, J., Narula, R. and Trevino, L. (1996), ‘The role of export processing zones for host countries and multinationals: a mutually beneficial relationship?’ The International Trade Journal, Vol. 10(4), pp. 435-466.

6 Saggi, K. (2000), ‘Trade, foreign direct investment, and international technology transfer: A survey’, World Bank Working Paper Series in International Economics, No. 2349.

local firms to upgrade their technologies leading to further competition and an even faster rate of adaptation of the new technology<sup>7</sup>. The greater the competition, the more the MNE will then have to bring in new technology to retain their competitive advantage, leading to greater potential spillovers<sup>8</sup>. If however, local firms are not developed enough to compete, the superior technology of the MNEs can crowd them out.

Labour migration:

Technology may also be transferred through workers employed by MNE affiliates acquiring knowledge of its technology and management practices, after which they move to local firms or set up their own firms.

**The situation in Tanzania**

**1. Local mining companies already have considerable technological capability**

Chart 1 shows the majority of local mining firms have only basic technological capability including being able to maintain machinery (62% of companies surveyed), improving work efficiency (42%), and planning and control of production (38%). Others with some appreciable level of technological capability include automation of processes (36%), development of new production process (34%), introduction of major improvement to machinery (34%). Marketing strategies, which is another important component of innovation capabilities had been acquired to a much lesser extent.

**Characteristics of firms surveyed**

- All privately owned
- Majority set up after 1993 (due to the liberalisation of the economy)
- More than half classified as small enterprises (5-49 employees)
- Only 2 medium size (up to 100 employees) and 3 large enterprises (more than 100)
- In terms of capital investment, more than half are small enterprises ( 5-200 million shillings) while the rest are micro (less than 5 million shillings). Only one had large scale capital investment

The major innovations related to increasing efficiency in the production process:

These included the development of a prototype for crushing machines using scrap metal and the diesel engine of a milling machine, and the introduction of other machines including a water pump (to extract water from the mining shafts), excavating machines (to replace hammers), metal detectors and compressors. These innovations indicate a move away from labour to capital-intensive production which is more efficient.

However, despite such innovations, most of the local mining firms still have low technological capabilities. Some companies have introduced relatively modern technologies, demonstrating an appreciable level of technological capability but very few of these capabilities can be attributed to the presence of FDIs in the country or interaction with foreign mining companies as a result of such interactions.

*Local firms are slowly raising their capabilities but FDI has played a minimal role*

- 5.9% of firms introduced major improvements to machinery

7 Sjöholm, F. (1997), 'Productivity growth in Indonesia: the role of regional characteristics and direct foreign investment', Economic Development and Cultural Changes, Vol. 47, pp. 559-584.

8 Wang, J.-Y. and Blomström, M. (1992), 'Foreign direct investment and technology transfer', European Economic Review, Vol. 36, pp. 137-155.

- 6.5% improved their maintenance of machinery
- 5.3% improved their planning and control of production.

Interactions included:

- Joint mineral exploration research, through which the local company gained exploration skills.
- Training conducted by a foreign mining company on general mining skills and strategies for a group of local small miners.
- Provision of clear specifications on minerals to be bought from local companies.

**Chart 1:**

Level of Technological Capabilities in the Tanzanian Local Mining Companies			
Innovative activities	Frequency	Percent N=50	
Introduce minor adaptations to product	0	0	
Improve product quality	0	0	
Conduct regular quality control to maintain standards and specifications	0	0	
Introduce minor changes to process technology to adopt it to local conditions.	13	26	
Maintain machinery and equipment	31	62	
Introduce planning and control of production	19	38	
Improve efficiency in existing work tasks	21	42	
Introduce automation of processes	18	36	
Obtain international certification	0	0	
Improve layout of product	0	0	
Develop new production process	17	34	
Introduce major improvement to machinery	17	34	
Introduce major improvement in the way the work is organized	17	34	
Introduce new marketing strategies	10	20	
Enter new markets	5	10	

Source: Field data, 2011.

## 2. Linkages between foreign and local firms are very weak

The paucity of interaction as shown above indicates how weak the linkages are between foreign and local firms. In fact local firms have acquired far more from other sources. They have acquired very little from the MNEs (Chart 2).

Reasons for weak linkages include:

- a) Foreign mining companies exist as small self centred, self reliant islands, importing their own machinery and exporting their products. This allows little room for the use of local inputs and forward and backward linkages.
- b) There is no local processing of minerals which would provide local miners with a reliable market for their products and extend linkages both within and the outside mining sector for intermediate goods. Such local processing is found elsewhere. In Chile, for example, the emergence of copper processing firms strengthened local linkages and improved competitiveness of local mining companies.
- c) Contrary to the expectations of the researchers, there have been no spillovers in terms of observation and reverse engineering. Nor has there been any examples of employees of foreign mining companies setting up their own mining companies or joining existing local firms. This was explained by relatively better working conditions and pay in foreign firms compared to their local counterparts. In addition, for employees to set up their own firm requires, not only adequate capital but also well developed entrepreneurial skills and the willingness to take calculated risks.
- d) Communication barriers including a general lack of awareness of (or lack of interest in) local mining firms, exacerbated by a lack of intermediaries between the two and no personal or institutional efforts to bridge the gap, as well as language barriers since foreign mining executives do not speak Swahili and most local miners are not fluent in English.
- e) The low level of technology in local mining companies has often prevented them from seeking collaboration with, and learning from the foreign firms. It also contributes to foreign firms neglecting or not taking seriously local companies.
- f) Frequent conflicts between local people and foreigners over access to land and resources, as well as degradation of the local environment leading to mutual distrust.
- g) The lack of involvement of local governments. While they are well positioned to facilitate such linkages, contracts with foreign mining firms are signed by the central government, thereby allowing little space for local government.

*Foreign mining firms live in a world of their own and hardly interact with local firms*

### **3. Linkages can and should be improved**

Ways of improving linkages include:

- Taking advantage of a cluster setting (whereby foreign and local mining firms are situated close to one another) to share information and equipment.
- Local marketing of minerals, which largely depends on local processing of minerals.
- Joint workshops, training and seminars enable both sides to be connected and to share exploration, production and market information and opportunities.

Such linkages are not only important in building good relations between local and foreign firms, they are also a part of the corporate responsibility of the foreign firms. Therefore, policies should be developed which mandate and provide the environment for such interactions, linking also with local government.

Chart 2:

Sources of Knowledge for the Implemented Innovative Activities

	Acquired from FDI				
	N	Frequency	%	Frequency	%
Introduce minor adaptations to product	0	0	0	0	0
Improve product quality	0	0	0	0	0
Conduct regular quality control to maintain standards and specifications	0	0	0	0	0
Introduce minor changes to process technology	13	3	23	10	77
Maintain machinery and equipment	31	2	6.5	29	93.5
Introduce planning and control of production	19	1	5.3	18	94.7
Improve efficiency in existing work tasks	21	0		21	100
Introduce automation of processes	18	0		18	100
Obtain international certification	0	0	0	0	0
Improve layout of product	0	0	0	0	0
Develop new production process	17	0	0	17	100
Introduce major improvement to machinery	17	1	5.9	16	94.1
Introduce major improvement in the way the work is organized	17	0	0	17	100
Introduce new marketing strategies	10	0	0	10	100
Entered new markets	5	0	0	5	100

Source: Field data, 2011.

However, despite geographical proximity, and common interests, such linkages are tenuous to say the least. This has been blamed on lack of government strategies to create space for linkages, as well as linkages between small mining companies to learn from one another and even collaborate on issues of technology acquisition and marketing.

**4. Mineral processing (as opposed to extraction only) would greatly enhance the development of technological capacities**

Mineral processing is much stronger than mining in its capability to create backward and forward linkages with other industrial sectors<sup>9</sup>. This has hardly happened in Tanzania.

<sup>9</sup> Boucoum (1999,2000)

## What needs to be done

The study shows that if Tanzania is to benefit from FDI, the government needs to be more proactive in creating the right environment for development of the technological capabilities of Tanzanian firms involved in mining. At present, local firms hardly benefit at all, while in other countries, the government regulates FDI and ensures forward and backward linkages. Much can be learned from other countries like Botswana in this.

i) There is an urgent need to establish and maintain harmony between local communities and foreign mining companies working in their area. This requires many actions beyond the scope of this brief but without which the recommendations on technological capabilities cannot be implemented.

ii) A key aspect of maintaining harmony and promoting equitable development is to enhance collaboration between local small scale miners and foreign mining companies. At the very least, this can be done by bringing together foreign and local mining companies through for instance mining investors forums where they discuss pertinent issues and ultimately build long term linkages and interactive learning to share and improve technological capabilities.

iii) A more long term approach is to develop innovative clusters around the mining sites. Such clusters which could be anchored around foreign mining companies have the potential to enable enterprises to overcome many binding constraints in the areas of capital, skills, technology and markets. A cluster approach would include development of incentives to promote further avenues for interaction such as training and joint mineral exploration.

iv) The government, in collaboration with other stakeholders, should carry out further research into the way clusters work in other countries. Some of the questions that need answering include:

1. What are the competitive advantages of mining clusters in Tanzania?
2. How have mining clusters elsewhere evolved over time and what determined that evolution?
3. What has been the role for public policy in the performance or lack of performance of the mining clusters?
4. What strategies and collective actions could stimulate the potential for upgrading of competitive advantage in mining clusters in Tanzania?

v) Emphasis should be put on developing local minerals locally as this will greatly enhance interaction and development of local technological capabilities. *Without proactive and strategic government action, technological capabilities of local firms will continue to lag behind or even stagnate*

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