

Chinese investment and knowledge transfer in Africa

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Key messages:

1. Chinese investment can be a channel for transferring productivity-boosting knowledge to African host countries through training, linkages with the local economy and technology transfers.

2. Early research shows that training programmes seem to have succeeded in upgrading skills in the short term. There is also evidence of increased productivity through technology transfer.

3. Knowledge transfers through backward and forward linkages was limited, but this normally takes the longest time.

This brief summarises and sets in context emerging findings from DEGRP project '[Chinese FDI and structural transformation in Africa](#)'. Led by Deborah Brautigam, Director of Johns Hopkins' China-Africa Research Initiative, the project is studying the potential for Chinese investment to enhance structural transformation in Africa, with a focus on knowledge transfer between Chinese and African firms. So far studies have been completed on Madagascar, Kenya, Zambia, and Malawi.

Foreign investment and knowledge transfer

Foreign investment can be an important catalyst for economic growth in developing countries. Under certain conditions, these investments can create employment and help increase production in the host country (Moran, 2006).

One of the most important ways in which foreign investment benefits host countries is the diffusion of productivity-enhancing knowledge into the domestic market. Knowledge can be transferred – both intentionally and unintentionally – from foreign to domestic firms in the form of skills, technology, and 'tacit knowledge' related to production, including management and organisational practices.

Training of the domestic workforce, either formally or informally, is a common channel for knowledge transfer. Labour circulation between firms then allows technical and managerial skills to move from one firm to another. Knowledge and ideas can also spill over to local firms through imitation of foreign firms, acquisition of new machinery, and subcontracting. Backward linkages (using inputs produced in the host country) and forward linkages (producing input for use in the host country's production processes) are also vehicles for knowledge transfers.

However, knowledge transfer is not a given. If foreign firms have limited contact or connection with the local environment (for instance, if they use only imported inputs and hire only foreign workers), their impact on host countries will likely be limited.

China partly owes its recent success to the degree to which it has managed to obtain these skills and technology transfers from inward foreign investment (Tseng & Zebregs, 2002; Yao, 2006). As an outward investor, is China fostering similar skills transfers and technological upgrading in the countries in which it is investing?

The DEGRP research

Aims

Since September 2015, DEGRP-funded researchers from Johns Hopkins' China Africa Research Initiative (CARI), have been collecting data on and comparing the experiences of selected African countries hosting Chinese firms, to assess the extent of knowledge diffusion between the firms and the host countries.

So far, three case studies have been completed on four countries: Madagascar, Kenya, and Zambia and Malawi. The studies on Madagascar and Kenya focused on a sample of agriculture and manufacturing firms, whereas the combined study on Zambia and Malawi focused on the cotton sector, comparing the business model of a Chinese-owned cotton firm with that of an American counterpart.

Methods

The project is using a mixed-method approach comprising both quantitative and qualitative data collection and analysis. The three case studies conducted so far are based on semi-structured qualitative interviews with Chinese managers and workers, government officials, and representatives of the Chinese business community, with the goal of identifying examples and modalities of knowledge and technology transfers from Chinese to African firms.

In Madagascar and Kenya, the researchers identified Chinese firms to be interviewed through a two-stage process. During the first stage, they collected a list of Chinese firms operating in these countries from the Chinese Ministry of Commerce (MOFCOM) and compared these with lists obtained from the countries of research. The researchers then drew data from these lists, but also used snowball sampling to identify additional firms and stakeholders to interview.

The third study, a combined investigation into the cotton sector in Zambia and Malawi, differed from the first two, in that the team identified in advance a Chinese company, the China-Africa

Cotton Company (CAC), and an American counterpart, Cargill, both operating in Zambia and Malawi, to assess their business model and their knowledge transfer effects. For this study, semi-structured interviews were carried out with government officials, company managers, cotton associations, extension workers, research institutions and other donor agencies. In addition to this a survey was carried out among contracted cotton farmers, and data on input distribution and cotton production was collected from the firms.

Box A: Sourcing accurate data on Chinese investments in Africa

For the Madagascar and Kenya case studies, researchers compared firms' lists provided by both Chinese and host countries' authorities. Interestingly, in both cases the lists did not match.

There are several possible explanations for these differences. The Chinese Ministry of Commerce (MOFCOM) list generally only includes companies who engage with or seek support from MOFCOM. Therefore, Chinese firms operating at a smaller scale or at the informal level might not be included. In addition, the MOFCOM lists might include investments approved by the Chinese government but not materialised in country.

Investment data provided by host countries also present problems. Lists often include closed or non-operational investments, as well as approved or pledged (but not realised) investment. Sometimes they also list investment incorrectly in terms of origin, and might not include all investment occurring in the country.

This lack of accurate data can create confusion about the magnitude of Chinese investment in Africa, which is important to dispel. Often the confusion surrounds not only investment data but also data on China-Africa aid, loans, trade, migration, contracts, and land acquisition. The China-Africa Research Initiative is working to collect and compile more accurate and accessible data for these areas. For more information see sais-cari.org/data/.

Findings

The case studies conducted so far have yielded evidence of knowledge transfer and spill-over in three areas: training, machinery and equipment, and backward and forward linkages.

Training

Training is one of the most common and immediate ways to achieve knowledge transfer. In all the countries analysed, firms provide training to their local workers, either through formal programmes or on-the-job training and mentoring.

Training centres and formal programmes

In Madagascar, research revealed that Hunan Agri (an agricultural firm, and one of the largest Chinese investors in the country) had set up an agro-technology demonstration centre outside Antananarivo to teach local farmers how to produce a new variety of hybrid rice. Started as a Chinese development cooperation project in 2007, the centre is still active in providing training and demonstration programmes, and in producing training material in the Malagasy language. Another Chinese company, Tianli Agri, has set up 15 training centres run by Chinese technicians to teach cotton planting and farming techniques to locals.

The team also found that other training activities are provided through aid programmes, both Chinese and non-Chinese. In Malawi, the China-Africa Cotton Company (CAC) manages an agricultural technology demonstration centre tasked with showing local farmers how to improve the productivity of their crops, for example through improved field management. Originally set up as a Chinese aid programme, the centre has now been transferred to the Malawian government, but it is still run by Chinese staff.

The Zambian arm of CAC also provides some training to its workers and suppliers. CAC cotton buyers, for example, receive a one to two days' training from Zambian managers twice a year. The buyers in turn provide some training to their

farmers, and also provide ad hoc advice when they visit them. In contrast to training in the other countries studied, this training is not based on Chinese knowledge, because the contract farming model is not used in China's cotton sector, although it is used for other crops. The Chinese executives leave it to the Zambian managers to develop the trainings themselves, based on other courses they have attended or resources they find online.

Compared with that of its American counterpart Cargill, however, CAC Zambia's training is quite limited in scope. Meanwhile, Cargill provides longer trainings to its buyers and farmers, as well as in-house training for managers. That said, CAC did seem interested in expanding its training offerings. In addition, Cargill's training is supported by the German Development Cooperation (GIZ)'s 'Competitiveness for African Cotton Initiative' programme.

While CAC does not pay very much attention to training to its farmers and suppliers, it does a better job providing training to employees and managers through both Chinese and non-Chinese institutions. For example, employees and managers can attend courses and training provided by CAC, both in-country and in China, funded either by the company itself or through Chinese aid programmes.

However, some are sceptical about the value of these opportunities: several interviewees suggested they are simply for show, with little practical application in Zambia. Workers in the cotton sector can also benefit from training provided by the Farmers' Field Schools, funded by the Food and Agriculture Organisation of the United Nations.

On-the-job training

On-the-job training is also common in Africa. In many African countries, the technical and vocational training on offer is often outdated, or does not respond to the business needs of the private sector. Offering on-the-job training resolves these issues. It also has the advantage that it can be tailored to the machines and technologies used by a specific company, and

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then administered flexibly according to how much support the workers need. All case studies found some form of on-the-job training being given.

In Madagascar, research showed that Chinese firms train workers on the job for a period ranging from a few days to three months. Some firms pair new workers with more experienced colleagues, who assist them in performing their tasks until they are able to continue unaided.

Chinese firms in Kenya also train their workers on the job, often during the probation period. The training is usually conducted by experienced Chinese or local workers, but there is a general preference to retain the Chinese workers for as little as possible, as they are more costly than their local counterparts.

In Kenya, some workers have gained skills at the technical and managerial level via on-the-job training, and managed to leverage those skills to start their own business. A firm noted that some of its former workers started working independently, either with their old firms, as contractors for smaller projects or as distributors, bringing in local clients.

The Zambia and Malawi study revealed a similar pattern. As well as its cotton production, CAC also has a small factory in Zambia with around 100 workers working on cotton ginning, oil extraction and other activities. Local workers trained on the job have been running the factory since around 2014, with only a few Chinese staff remaining for supervision purposes.

Inputs, machinery and equipment

Technology transfer is another important aspect of knowledge diffusion from foreign firms to host countries, either in the form of machinery, equipment, production processes, or organisational processes and models (Sönmez, 2013). Examples of this type of transfer by Chinese firms are found in all three case studies.

In Zambia, CAC has contributed to technology improvements and upgrading. For example, the company introduced improved seed varieties, cost-efficient chemical products and digital scales

that can increase productivity in cotton production.

In Madagascar, the researchers found one Chinese firm selling agricultural machinery primarily to domestic buyers. Chinese firms also brought new biotechnology to Madagascar, including the high-yield rice mentioned earlier, as well as cotton. However, the cost and lack of effective distribution channels have prevented local firms from taking full advantage of these new technologies.

Technology transfer is not only about transferring pre-existing foreign technologies, however. In some cases, foreign firms also introduce innovation developed in and for the local market. It has already been shown how CAC adapted Cargill's outgrower model for its cotton production in Zambia. In Kenya, Yishan Agriculture employs Chinese agro-technicians to develop new technologies that are more suitable to the local environment, then train farmers in these technologies and supervise them in their adoption.

Linkages and clustering

Linkages between Chinese and domestic firms can also result in skills and technology transfer. Working to provide input for, or to use input provided by Chinese firms, African firms can learn new production and management skills, and increase their productivity. Moran (2006) argues that foreign firms show a strong motivation to develop supplier networks close to their plants in the host countries, and describes how this process encourages local firms to increasingly upgrade their production to supply foreign firms located in their country. These effects are further amplified if foreign firms cluster around certain geographic areas (Thompson, 2002).

So far, the experience of the three case studies has shown limited examples of the formation of backward and forward linkages. For instance, in Kenya, the team found that most Chinese firms operating in Kenya source their inputs from Chinese or East Asian firms, either based in Asia or in East Africa.

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Similarly, in Madagascar, there are a small number of Chinese-owned export-oriented firms importing raw materials and exporting finished products. Apart from the employment they generate, these firms have a limited impact on the domestic economy, both in terms of income generation and knowledge transfers.

In Madagascar, the strongest linkages have formed in the agriculture and agribusiness sector, where Chinese firms source material from domestic producers. For example, Tianli Agri sources Malagasy cotton for processing in its spinning plants in Mauritius. Another successful example is the agricultural machinery company supplying domestic and foreign firms, mentioned above.

Evidence of clustering of firms encouraged by Chinese investment is also limited. In Madagascar, clustering of Chinese firms is taking place in certain sectors (cotton and textiles, rice, aquaculture, and window production) but the domestic political situation continues to pose a challenge for the growth of Chinese firms. There are plans to establish industrial zones, especially for the production of construction material, but these have stalled due to bureaucratic and political challenges.

What does this teach us?

It is still too early in the project to form a detailed picture of how much knowledge transfer is occurring between Chinese companies and their African host countries. However, these initial findings already show that while knowledge transfer is taking place in the four contexts examined so far, it is happening to different extents and in different ways.

Training programmes seem to have succeeded in upgrading skills in the short term. Training and demonstration centres, especially in the agricultural sector, have been part of Chinese aid programmes for a long time, and their positive impact in terms of knowledge transfer is also substantiated by other research (Jiang, Harding, Anseeuw, & Alden, 2016). But when disconnected from aid budgets, the financial sustainability of these centres remains an issue.

The Kenyan case has shown how some workers have gained skills at the technical and managerial level, and even attempted to leverage those skills to start their own business.

There is also evidence of increased productivity through technology transfer, particularly in the agricultural sector. Machinery and inputs provided by Chinese companies are widely used and have brought benefits in terms of productivity, as demonstrated in the Zambia and Madagascar examples.

So far, the area where progress has been slower is the creation of linkages with local firms. This is not surprising, as this is the effect that takes the longest time. Domestic firms need to learn what products foreign firms want, and adapt their processes to produce something that fits the customers' specifications. This learning process usually works through trial and error, and it can take a few attempts before the new product or service is mastered.

The positive effects are more visible in the agricultural sector, where Chinese firms make use of local primary inputs. In the manufacturing sector, the creation of linkages is lagging, and in some cases non-existent. This issue is less prominent for countries that have limited involvement in global production networks, such as Madagascar. For countries involved in global value chains, linkages can remain limited if all inputs are imported, processed and the final product is exported with little gain beyond the employment impact. To enhance the positive effect of these firms on the host countries, linkages need to be created with the domestic private sector.

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Key project outputs to date

Publications:

Chen, Y. and Landry, D.G. (2016) 'Where Africa Meets Asia: Chinese Agricultural and Manufacturing Investment in Madagascar', SAIS-CARI Working Paper 5. Washington D.C: Johns Hopkins University.

The working papers on Kenya and Zambia and Malawi are forthcoming, and will be published on the SAIS-CARI website: www.sais-cari.org.

Video:

[Foreign Direct Investment & Structural Transformation](#) – Interview with DEGRP project lead Deborah Brautigam

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