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| Institution: University of Oxford | | |
| Unit of Assessment: 22B Development Studies | | |
| Title of case study: Transforming global and national policies on innovation in Low Income Countries (LICs) | | |
| Period when the underpinning research was undertaken: 2012-16 | | |
| Details of staff conducting the underpinning research from the submitting unit: | | |
| Name(s): Xiaolan Fu | Role(s) (e.g. job title): Director, Technology and Management Centre for Development (TMCD) | Period(s) employed by submitting HEI: 01/09/2006-present |
| Giacomo Zanella | Research Officer, TMCD | 01/10/2012-31/12/14 |
| Period when the impact occurred: 2014-31 December 2020 | | |
| Is this case study continued from a case study submitted in 2014? N | | |
| 1. Summary of the impact (indicative maximum 100 words) | | |
| <p>The <i>Diffusion of Innovation in Low Income Countries (DILIC)</i> project led by Professor Xiaolan Fu has been a major driver of a new and constructive international discourse on science, technology and innovation in developing countries. Initial field research in Ghana informed industrial policy in that country and strengthened wider African capabilities for quantitative policy research on innovation. These outcomes in turn generated a new approach to innovation at the UN: initially in the resolutions of the International Conference on Financing for Development at Addis Ababa; then in the objectives of the UN 2030 Agenda for Sustainable Development, and specifically on Sustainable Development Goals 9 and 17; and ultimately in the creation of the UN Technology Facilitation Mechanism supported by the new UN Technology Bank.</p> | | |
| 2. Underpinning research (indicative maximum 500 words) | | |
| <p>Until recently, indigenous industrial innovation was not seen as a priority for low-income countries (LICs). Firms in LICs are necessarily highly innovative to survive, generating “under-the-radar” innovations that reflect the circumstances they face. However, governments in these countries are unable to consolidate and spread these indigenous innovations to generate a self-sustaining process that would enable them to match technological advancement in northern countries. Specifically, in the case of Ghana there have been few links between universities and industry; links that have been found to be critical for innovation in industrialising economies (R1).</p> <p>The <i>Diffusion of Innovation in Low Income Countries (DILIC)</i> project at Oxford was the first comprehensive evidence-based study on innovation in LICs. It reviewed and analysed the global evidence available on the nature of innovation in LICs, origins and diffusion channels, barriers to innovation, and the role of innovation in sustainable development. Because this was the first rigorous survey of the topic, important yet unrecognised barriers to innovation were identified and potential solutions proposed for validation in the field. This comprehensive review was complemented by an in-depth study of Ghana, known as the “Ghana Innovation Survey”, which covered over 500 Ghanaian businesses, with 23 case studies of individual firms, including informal businesses (R1, R2). The survey took place over two rounds, conducted in 2013 and 2015.</p> <p>The DILIC project was funded by ESRC-DFID and supported by the United Nations Conference on Trade and Development (UNCTAD) and the Ghanaian government through the Science and Technology Policy Research Institute (STEPRI), which forms part of the Council for Scientific and Industrial Research (CSIR). The research was led by Xiaolan Fu and Giacomo Zanella (Oxford) in collaboration with Pierre Mohnen (Maastricht University) and a multinational team of researchers and advisors from universities and agencies in Europe and Africa. The Ghana partner explains that: “CSIR-STEPRI agreed to collaborate with Oxford University on the DILIC project because from the onset the project was</p> | | |

strategically designed in a way that clearly showed its ability to achieve some extended impacts in Ghana and beyond” [C1].

The combination of the international survey and the Ghana fieldwork indicated that:

- contrary to received wisdom, innovation happens in both informal and formal sectors in LICs, through adoption and adaptation. However, this innovation is unsupported and not scaled up in a way that might drive structural change in LICs (R1).
- Firms derive knowledge from external sources, especially from customers and from participation in value chains and regional production networks (R3, with Shujin Zhu of Hunan University).
- Knowledge transfer from multinational enterprises (MNEs) and from universities to local firms in LICs is weaker than in East Asia, although transfer of knowledge from Chinese MNEs was stronger (R4, with former ODID MPhil student Cyrielle Auffray).
- There are marked gender differences in innovation: women are less likely to introduce technological innovations, but more likely to adopt marketing innovations (R5, with CS Srinivasan of the University of Reading and Bhavani Shankar of SOAS; R6, with CS Srinivasan of the University of Reading).
- Links between universities and industry are scarce in Ghana, even though such links are known to be crucial for innovation because universities provide skills and capacity that enable firms to move beyond learning-based innovation (R1).

3. References to the research (indicative maximum of six references)

R1 Xiaolan Fu (2020) *Innovation under the Radar: The Nature and Sources of Innovation in Africa*, Cambridge University Press, ISBN 9781107183100 [Available upon request] [output type: A]

R2 Xiaolan Fu, Pierre Mohnen and Giacomo Zanella (2018) ‘Innovation and productivity in formal and informal firms in Ghana’, *Technological Forecasting & Social Change* 131: 315-25, <https://doi.org/10.1016/j.techfore.2017.08.009> [output type: D]

R3 Shujin Zhu and Xiaolan Fu (2013) ‘Drivers of export upgrading’, *World Development* 51: 221-33, <https://doi.org/10.1016/j.worlddev.2013.05.017> [output type: D]

R4 Cyrielle Auffray and Xiaolan Fu (2015) ‘Chinese MNEs and managerial knowledge transfer in Africa: the case of the construction sector in Ghana’, *Journal of Chinese Economic and Business Studies* 13 (4): 285-310, <https://doi.org/10.1080/14765284.2015.1092415> [output type: D]

R5 Giacomo Zanella, CS Srinivasan and Bhavani Shankar (2014) ‘Transaction costs, information technologies, and the choice of marketplace among farmers in Northern Ghana’, *Journal of Development Studies* 50 (9): 1226-39, <https://www.tandfonline.com/doi/full/10.1080/00220388.2014.903244> [output type: D]

R6 Giacomo Zanella, CS Srinivasan (2014) ‘Information sources, ICTs and price information in rural agricultural markets’, *European Journal of Development Research* 26 (5): 815–31, <https://doi.org/10.1057/ejdr.2014.1> [output type: D]

4. Details of the impact (indicative maximum 750 words)

The *Diffusion of Innovation in Low Income Countries (DILIC)* research project had found that increasing technological capabilities in LICs needed to be seen by researchers and

policymakers as an essential *means* of development and not just as a desirable future *outcome* of development. The original research site was Ghana, so the *first* goal was to ensure policy and institutional changes there and elsewhere in Africa. The *second* planned step was to ensure a change of view in the wider development community concerned with industry and technology in LICs – particularly the United Nations agencies: “Oxford University set the foundation for a policy-focused project engaging policymakers and relevant stakeholders from the project’s inception. Policymakers in response accepted the project’s objectives and agreed to consider them in their work plan” [C1]. The *third* stage – difficult to foresee initially but feasible after the second step – was to transform UN institutions themselves so as to permanently embed this new view of innovation in international development doctrine.

Building government capacity for innovation in Ghana and Africa

The Minister of Environment, Science and Technology in Ghana acknowledged the importance of the Ghana Innovation Survey programme [R1, R2] for Ghanaian industrial strategy and implemented one of its main findings – that better links between university and industry were needed to facilitate innovation in Ghana – in a programme to strengthen university-industry collaboration [C1], [C2]. Later in 2014, at a DILIC dissemination conference held in Accra, the same minister called on African governments to “take innovation seriously and work to track innovation performances in their countries” and hoped that “the research activities of the DILIC Project would be mainstream[ed] into national programmes after the three-year lifespan” [C3].

The second Ghana Innovation Survey [R1, R2], undertaken in 2015, asked business about their collaborations with universities in the period 2013-14. The survey showed that collaboration with universities and research institutes had increased since 2012: 50 firms (out of a total of 495) were collaborating with universities, 19 more than in the previous survey. More than 60% of the collaboration was established proactively by a university, which was a significant change in comparison to the initial survey, covering the period 2010-12, when there was no collaboration initiated by a university [R1: p110 and 114].

As the Director of CSIR-STEPRI acknowledged, the survey work undertaken by the team “filled a knowledge gap by examining in-depth the diffusion of innovation in Ghana” [C1]. They also acknowledged how their staff had benefitted from data collection training: “the DILIC project enabled the Oxford University to enhance CSIR-STEPRI’s research and project implementation capacity. Certain basic research skills were improved” [C1].

Following online training by the DILIC team, Ghanaian researchers from the CSIR-STEPRI team went on to train researchers in Tanzania to apply the innovation survey methodology [C1]. The DILIC findings also informed government policies in Tanzania on the provision of training and subsidies to support innovation.

As a result of this work in Africa, the World Intellectual Property Organisation (WIPO) approached DILIC for a methodology that was more appropriate for LICs, and used the survey instrument in Uganda: “WIPO had been approached by Uganda to do some study work on both formal and informal aspects of innovation in the agri-food processing sector ... I then asked ... whether we could work together on this, and use some of [DILIC’s] methods in survey collection of data. ... The DILIC methodology was more appropriate for LICs than previously existing innovation survey methodologies ... due to its specific focus on characteristics of the informal innovator and informal innovation clusters. As a result of this collaboration, in 2016, DILIC’s survey methodology (as first trialled in Ghana) was adopted by WIPO in the Uganda research process on innovation in the agro-processing sector. The data gathered in Uganda has gone on to benefit associated national innovation policy-making and evidence on how to apply these surveys in sectoral developing country contexts. This kind of data collection has transformed our thinking/practice as to how we think about innovation in developing countries. WIPO member countries took to these findings with great interest – more of this type of work is expected to do justice to novel and different form[s] of informal cluster innovation” [C4].

Changing the understanding of innovation in LICs internationally

The DILIC project findings thus transformed policymakers' understanding of the potential for and barriers to innovation in LICs, and through UNCTAD (the lead UN organisation in this field) were disseminated across the developing world. According to the Director of the UNCTAD Technology Division, the project contributed to filling a "vacuum" in research on the innovation process in low-income countries with "valuable, coherent and consistent data" [C5].

Professor Fu was invited to address the UN General Assembly meeting on "Fostering science, technology & innovation" in New York in 2014, which was a preparatory event for the third UN International Conference on Financing for Development, due to take place in Addis Ababa the following year. At this session, drawing on results from DILIC, Professor Fu provided an overview of the state of science, technology and innovation in developing countries. She noted that despite significant catching up with developed countries, progress had mostly been concentrated in middle-income countries. Gaps between low and middle-income developing countries were evident in the lower levels of patent applications, journal papers, and investments in research and development in the latter.

Grounded in her research, she noted that most of the innovations carried out in developing countries, for example in firms in Africa, were low-cost innovations (R1), with a lack of finance as a critical constraint, particularly for larger-scale innovations. In terms of policy actions, she suggested that both public and private financing would be needed at the national level to provide different types of finance for different stages of the technology cycle. Education, training and stronger linkages and collaboration among firms and universities were also key [C6]. Subsequently, the Economic Affairs Officer at the Financing for Development Office, United Nations Department of Social and Economic Affairs (UN DESA), wrote that "it was very evident that your intervention was most relevant and will certainly inform the upcoming intergovernmental process in the lead up to the Addis Ababa conference" [C7]. This recognition was then reflected in an invitation to lead a symposium at the UN Development Cooperation Forum in April 2015 in South Korea.

The third UN International Conference on Financing for Development took place in Addis Ababa in July 2015. The outcome was the "Addis Ababa Action Agenda", which included "Science, technology, innovation and capacity-building" as one of seven "action areas" for UN Member States [C8]. In this "action area", the influence of the DILIC project can be seen clearly, for example: "We will encourage knowledge-sharing and the promotion of cooperation and partnerships between stakeholders, including between Governments, firms, academia" (R2) [C8].

The Addis Ababa Action Agenda fed into the United Nations 2030 Agenda for Sustainable Development, which was agreed at the UN Summit on Sustainable Development in New York in September 2015. Both UNCTAD (which had been a partner in DILIC) and UNIDO had already been pushing for innovation to be given a higher priority in the SDGs. Professor Fu's involvement in the preparatory meetings before the New York summit meant that DILIC findings and recommendations contributed significantly to the formulation of SDG9 ("Build resilient infrastructure, promote inclusive and sustainable industrialisation and foster innovation") and SDG17 ("global cooperation in a cumulative and collaborative way").

Specifically, a Senior Economic Affairs Officer from the Division for Sustainable Development Goals states that, "Paragraph 70 of General Assembly resolution A/RES/70/1 ('Transforming our world: the 2030 Agenda for Sustainable Development') ... is unusually detailed and considered most of the principles and recommendations arising from Prof. Xiaolan Fu's DILIC project work [and] followed a fully multi-stakeholder format which constituted an entirely new working model for the UN. It goes without saying that General Assembly resolutions do not typically cite particular research projects, but the intellectual source can be traced directly to Prof. Xiaolan Fu's research and engagement" [C9].

Helping to develop UN mechanisms to support innovation

The Addis Ababa Action Agenda also called for the establishment of a Technology Facilitation Mechanism (TFM) in order to support the implementation of the SDGs. The TFM facilitates multi-stakeholder collaboration and partnerships through the sharing of information, experiences, best practices and policy advice among Member States, civil society, the private sector, the scientific community, United Nations entities and other stakeholders. Professor Fu was appointed by UN Secretary General Ban Ki-Moon to the ten-person advisory team of the TFM [C10] in 2015 and DILIC's local partner in Ghana, Dr George Essegbey, in 2016. A key task of the TFM was to create an online platform for technology facilitation for innovators, policymakers and entrepreneurs from developing countries and in 2016, Professor Fu was elected leader of the online platform's independent review working group. The resulting platform, 2030 Connect, was launched in July 2020 by the UN's ICT Office [C11].

In recognition of the importance of the Oxford research, Professor Fu was also appointed by the UN Secretary-General to the Governing Council of a new UN Technology Bank for Least Developed Countries (LDCs) in 2017. The new UN bank aims to implement the TFM by supporting technology access, acquisition and utilisation in LDCs and promoting research networking among their science, technology and innovation communities. The bank (hosted by Turkey) started work in 2018 with the statutory aim of achieving SDG Target 17.8 ("Fully operationalize the technology bank and science, technology and innovation capacity-building mechanism for least developed countries by 2017 and enhance the use of enabling technology, in particular information and communications technology").

Overall, the significance of the contribution made by the DILIC project is well summed up by the United Nations Department of Economic and Social Affairs official: "Prof. Xiaolan Fu's engagement and research project's findings have greatly contributed to the emergence of a completely new and constructive discourse on science, technology and innovation at UN headquarters that has ultimately triggered policy and institutional change" [C9].

5. Sources to corroborate the impact (indicative maximum of 10 references)

C1 Testimony from the Director of the Science and Technology Research Institute, Council for Scientific and Industrial Research (CSIR-STEPRI), Government of Ghana.

C2 '\$500,000 Technology Transfer Centre Launched',
<https://www.newsghana.com.gh/500000-technology-transfer-centre-launched>

C3 'Make innovation a priority - African leaders urged',
<https://www.newsghana.com.gh/make-innovation-a-priority-african-leaders-urged/>

C4 Testimony from Head of Section, Department for Economics and Data Analytics, World Intellectual Property Organisation (WIPO), Geneva

C5 Transcript of comments delivered by the Director of the UNCTAD Technology Division at the DILIC End of Project High Level Conference, 2 November 2015, Overseas Development Institute, London

C6 Informal Summary by Secretariat, UN – 9-12 Dec 2014 meetings part of Preparatory Process for the Third International Conference on Financing for Development. (With web screenshots for corroboration). https://www.un.org/esa/ffd/wp-content/uploads/2015/01/FfD_SubInfSessions_Dec_Informal-Summary.pdf

C7 Email correspondence from Economic Affairs Officer at the Financing for Development Office, UN DESA, New York

C8 Addis Ababa Action Agenda: https://www.un.org/esa/ffd/wp-content/uploads/2015/08/AAAA_Outcome.pdf

C9 Testimony from Senior Economic Affairs Officer, Division for Sustainable Development Goals, United Nations Department for Economic and Social Affairs (UNDESA), New York.

C10 Letter from Secretary-General of the UN appointing Prof Fu to the TFM advisory group.

C11 Technology facilitation mechanism: Sustainable Development Knowledge Platform: <https://sustainabledevelopment.un.org/tfm>