Technological Forecasting & Social Change xxx (2016) xxx–xxx

Contents lists available at ScienceDirect

Technological Forecasting & Social Change

Technological inclusiveness: Northern versus Chinese induced technologies in the garment industry

David Botchie [a], David Sarpong [b,c], Jianxiang Bi [b]

[a] Development Policy and Practice, The Open University, Milton Keynes MK7 6AA, United Kingdom
[b] Bristol Business School, University of the West of England, Frenchay Campus, Bristol BS16 1QY, United Kingdom
[c] Research Lab for Science and Technology Studies, Institute for Statistical Studies and Economics of Knowledge, National Research University — Higher School of Economics, Myasnitskaya st., 20 Moscow, Russian Federation

ARTICLE INFO

Article history:
Received 28 November 2015
Received in revised form 31 March 2016
Accepted 7 April 2016
Available online xxxx

Keywords:
Africa
China
Garment industry
Technology inclusiveness
Uganda

ABSTRACT

The Northern economies have been the main sources of technologies for the global garment manufacturing industry. Over the past decade, China has become an important alternative source of these technologies offering a range of technological choices for small scale and dispersed production of cheap consumer goods, particularly in the developing world. Preceding a national foresight exercise aimed at enhancing the capabilities of small-scale garment producers in Uganda, we examine the potential 'inclusiveness' of garment sewing machines imported from the Northern economies and China, and their individual potential to enhance the capabilities of poor garment producers, particularly, women and rural dwellers. Data for our study included a survey and semi-structured interviews with 147 garment firms and other key informants. Compared to the Chinese sewing machines, we found that the Northern machines have high acquisition cost, relies on scale and advanced infrastructure, and tend to exclude poor rural producers (often women). The transfer of Chinese technologies to Uganda, we also found is much easier, have larger spread effects, leading to smaller gaps in technological know-how between China and Uganda because of the context in which Chinese technological innovations are induced. We conclude with some implication of our study to theory and policy.

1. Introduction

Despite the significant achievement in poverty reduction in Uganda, inequality and unemployment keep rising in this transition country. The garment sector has been identified as one of the key sectors that can help create jobs in transition countries as it has the potential to move labour from the inefficient agricultural sector to the manufacturing sector (Gereffi and Memedovic, 2003; Moghadam, 2015). However, limited investment in garment making technologies and erratic supply of energy are among the major contributors to the sub-sector's current low capacity in garment production (GoU, 2009). Scholarly and policy makers in this regard have advocated for massive investment in garment technologies to help improve Uganda's position in the industry to reduce poverty and inequality (Akoten and Otsuka, 2007). However, there are two main competing sources of garment making technologies in Uganda, and it is not too clear as to which of them the country should be investing in to help improve its position in the global garment making industry. Northern European countries, particularly Germany, United Kingdom, and Austria, remain the traditional sources of garment making technologies for the industry (Gereffi and Memedovic, 2003; Mytelka, 1991). Following substantial investment of Chinese firms in Africa, China in the past decade has become the alternative source of these technologies for the Ugandan garment industry. In this regard, the existing literature has identified various factors that shape and give form to the transfer, adopting and diffusion of these competing garment technologies in transition countries (Huang, 2003; James and Bhalla, 1993). The emerging consensus is that the Northern technologies compared to Chinese ones are much more durable, efficient, but expensive. The Chinese induced technologies on the other hand, are technological inferior, and cheap (Yamagata, 2007; Schrank, 2004).

Preceding a national foresight exercise aimed at enhancing the capabilities of small scale garment producers and reducing poverty, examine the potential appropriateness and 'inclusiveness' of these competing technologies, focussing on sewing machines in the Ugandan garment industry. By inclusiveness, we refer to the potential and appropriateness of these sewing machinesin enhancing the capabilities of poor producers, particularly women and rural dwellers, in ways that reduce inequalities which are known to offset the poverty reducing effect on economic growth (Hazarika et al., 2015; Ravalion, 2007). Inclusiveness in this context is also about improving the welfare of low income groups through the use of low cost technologies in a developing country (Paunov, 2013; Feder and Umali, 1993). We aim to provide empirical evidence to support policy makers in deciding which of the two

E-mail addresses: David.Botchie@open.ac.uk (D. Botchie), David2.Sarpong@uwe.ac.uk (D. Sarpong), Jianxiang.Bi@uwe.ac.uk (J. Bi).

http://dx.doi.org/10.1016/j.techfore.2016.04.011
0040-1625/

technologies they could potentially put their bet on to help improve the competitive position of Uganda's garment industry while reducing poverty among women and rural dwellers.

Drawing on firm level secondary data, survey, and semi-structured interviews with 147 garment firms, and statistical data from organisations such as the International Cotton Advisory Committee, World bank and Cotton Development Organisation, we compare the production characteristics of the two sewing machines, their repair and maintenance costs to assess their relative impact on poor producers in general, and women and rural producers in particular. We found that the Chinese induced sewing machines compared to their Northern counterparts have a discernible pro-poor, pro-women, and pro-rural impact on Uganda's garment industry. Contributing to the existing literature on technology inclusiveness, our study sheds light on the significant role of technology in poverty alleviation efforts in the third world.

The paper is structured as follows. First, with particular emphasis on the global garment industry, we provide a brief overview of the sources of inducement to the development of inclusive technologies and innovations. Second, we delineate the state of the Ugandan garment sector with emphasis on the sources of imports into the sector. Third, we present our sampling strategy, data sources and the operational framework guiding our inquiry. Fourth is our results and discussion. We then conclude with some implications of our findings for theory and policy.

2. Sources of inducement to the development of inclusive technologies and innovations

The appropriate technologies movement as espoused by the international organisations in the 1970s and 1980s were overwhelmingly driven by not-for-profit organisations. More recently, the rise of emerging economies such as China and India suggests that this dominant trajectory may be subject to change. The growth in capabilities in China, in particular, has coincided with a rapid growth in demand by poor consumers. These poor consumers may aspire to branded positional goods, but because of their low incomes will settle for simpler and lower quality products (Kaplinsky, 2010). This form of demand from poor consumers has reignited the appropriate technology concept with countries like China serving as the likely source. The re-emergence of the appropriate technology concept has led to the call for direct inclusive innovations for the poor and a better understanding of the Sources of inducement to the development of Inclusive technologies and innovations.

There are three broad sources of inducement for the development of technologies in China. The first is the increase in demand of low-cost technologies; due to rapid growth in markets in low income economies (Ruttan, 2001; Kaplinsky, 2010). This demand is driven mainly by low income earners' preference for function rather than position. As a result, consumers in developing countries are accepting China's strategy of producing low cost and inferior technologies into developing countries (Kaplinsky, 2013). Note that the low income level of consumers in most developing countries like Uganda is the main driving force for such low cost technologies. This may also serve as a conduit for poor consumers to be included in technology access and utilisation. As observed by Chataway et al. (2013), the more inclusive a given innovation, the more likely consumption decisions will be made at the individual or household level.

Relative factor prices are the second inducing source of technical change; this is driven by process technologies. Wages in the AD economies are a fraction of those in the northern economies. Therefore, new technologies produced in these economies are likely to be highly labour intensive (Kaplinsky, 2010). In addition, because these technological innovations occur in the context of weak infrastructure, innovation in the developing economies such as China may be more robust and do not require high quality infrastructure (Hazarika et al., 2015; Kaplinsky, 2010). Moreover, because there is weak standardisation in these developing economies, technological innovations in these economies may not take cognizance of international certification requirements. Furthermore, these technical changes arise from small-scale indigenous firms and focus on lower acquisition cost. The lowering of standard, coupled with their labour intensive nature and less reliance on infrastructure may point to the fact that unskilled labour and low income consumers may be included in the utilisation of such technologies.

Trajectories of innovating firms are the third factor that induces the production of technologies that are appropriate for developing countries. In their efforts to improve upon their products and processes, firms are frequently confronted with the challenge of scanning through their known contacts and data-sources mainly due to the availability of imperfect information. In the context of routines, they draw on their experiences past knowledge and networks to keep track of the changing environment and customer preferences (Kaplinsky, 2011). As such, these firms have their own path-dependencies and trajectories (Dosi, 1984). These large multinational firms in the northern economies mostly tend to focus on demands from their existing customers and disregard new technologies that will not satisfy the needs of their existing customers (Christensen, 1997). This is inconsistent with the growing belief that there is a huge market opportunity for transnational corporations (TNCs) in developing economies (Prahalad, 2006). On the other hand, southern-based trans-national corporations are in better position to develop technologies that are appropriate for low-income economies (Kaplinsky, 2011). Nevertheless, available studies have not sufficiently captured the inclusiveness of technologies from other emerging economies such as China relative those from the northern economies.

However, these technologies have been perceived not to have inclusive attributes for the less privilege in society, particularly women and rural dwellers. The Northern technologies were produced to suit labour saving technological progress, assumes high-quality infrastructure and produces products for high-income consumers, and therefore, difficult for the poor to acquire (Stewart, 1982; Kaplinsky, 2011). In addition, access to spare parts as well as the requisite information required for maintaining and repairing some of the northern technologies in the garment sector are limited (Bhalla, 1985). Some of the Northern made technologies produce on large scale and are skills intensive; therefore require skilled labour to operate them efficiently (Kaplinsky, 1990). In this regard, women are likely to be the worst affected. As indicated by Pearson (2000), women are relatively less skilled with higher levels of illiteracy compared to men. This creates more barriers for women when it comes to access and use of Northern technologies. Furthermore, women in developing countries bear a disproportionate burden undertaking time and labour intensive unpaid activities in their household. These include cooking, cleaning, fetching fuel or water, as well as child and elder care (Gill et al., 2010). For instance, women in rural areas spend from 1 to 5 h a day gathering biomass for fuel and 1.6 h a day collecting water in the dry season (Gill et al., 2010). This makes it difficult for women to venture into skills and wealth creating activities that will enable them adopt skills intensive technologies (Gill et al., 2010). Men on the other hand have full control over technologies in the households and work places. Husbands at home are mostly responsible for regulating the family radio, television, and even controlling when and how other family members use them (Gill et al., 2010). At work, technologies meant for women are often co-opted by men once their utility and profitability are established (Gill et al., 2010). This means that women who do gain access to technologies do not see the economic benefits associated with it (Gill et al., 2010).

Technologies from the Northern economies are the most efficient. For example, Eckaus (1955) argued that there was a limited range of efficient technologies available in a given period of time; and these technologies are concentrated in Northern economies—Europe and North America. Building on this assumption, Emmanuel (1982) posit that research and development are mainly concentrated in developed economies where income levels are high; as such technological progress can only originate from these economies. He goes further to explain that the economically efficient techniques are

Please cite this article as: Botchie, D., et al., Technological inclusiveness: Northern versus Chinese induced technologies in the garment industry, Technol. Forecast. Soc. Change (2016), http://dx.doi.org/10.1016/j.techfore.2016.04.011