Available online at www.sciencedirect.com
ScienceDirect
Technovation 29 (2009) 465–480
technovation
www.elsevier.com/locate/technovation

Establishing high-tech industry: The Tunisian ICT experience

Sana Harbi[a,*], Mariam Amamou[b,1], Alistair R. Anderson[c]

[a]Faculté de Droit et de Sciences Economiques et Politiques de Sousse, Cité Erriadh, Sousse, Tunisia
[b]Institut Supérieur de Gestion de Sousse, Sousse, Tunisia
[c]The Centre for Entrepreneurship, Aberdeen Business School, The Robert Gordon University, Aberdeen AB11 6EF, UK

Abstract

Although the high-tech sector in developed countries is well understood, there are considerable gaps in our knowledge about the high-tech sector in developing countries. This study addresses questions about the nature of high tech in Tunisia and about factors associated with information and communications technology (ICT) firms' success as examples of the high-tech sector. The literature identifies the key characteristics of the sector to be human capital, access to appropriate finance and supporting institutions to provide synergy. Thus we address these factors to establish if they have led to success in Tunisian ICT high tech. We surveyed 60 Tunisian ICT firms and employing a multiple component analysis, supported by a multinomial LOGIT analysis, we found that research and development was negatively associated with firm success. This, we argue, indicates the early stage of high-tech development. Our findings also suggest a subordinate role in the global value chain.The paper concludes with some observations and recommendations.

Keywords: High tech; ICT; Success; Developing countries; Research and development; Tunisia

1. Introduction

Arguably, the development of a successful high-technology sector plays an important role in the creation of national economic welfare. Gerschenkron (1962) spoke of "a great promise" for developing countries and Srholec (2007) notes how the idea that specialisation in technology-intensive activity matters for economic development is well established in the literature on technology change. Archibugi and Coco (2004) argued that technological capabilities have always been a fundamental component of economic growth and welfare, but note that they are far from being uniformly distributed across countries, regions and firms. Moreover, the extent and nature of the contribution of high technology remains unclear. Nonetheless, it is evident that the experiences of less-developed countries differ from that of the industrialised economies (Carayannis and Sagi, 2002). Aubert (2004) points out that there is considerable experience accumulated about developed countries, but much of this is not directly applicable to developing countries because of the nature of the challenges the latter face. Indeed, he claims that developing countries face genuine obstacles to innovation and this is precisely why they remain underdeveloped. These differences are also reflected at the academic level. Indeed, Cetindamar et al. (2008) show that in the case of technology management, there is a clear differentiation of major topics studied by academics in developing and developed countries. Medcof (1999) defines the high-tech sector as comprised of businesses that are heavily dependent on innovation in science and technologies whilst Vang and Asheim (2006) understand them as industries drawing on analytical and advanced synthetic knowledge bases. Innovation, by itself, is thus argued to be dependent on investment in research and development (R&D) and access to advanced knowledge bases. Lantz and Sahut (2006) argue that R&D expenditure in this sector should be considered as strategic investments.

This raises some interesting questions about the nature of high-technology firms in developing countries and about

*Corresponding author. Tel.: +216 23 22 12 70.
E-mail addresses: harbisana@yahoo.fr (S. Harbi), mariane5439@yahoo.fr (M. Amamou), a.r.anderson@rgu.ac.uk (A.R. Anderson).
[1]Tel.: +216 22 94 22 26.

0166-4972/$ - see front matter © 2008 Elsevier Ltd. All rights reserved.
doi:10.1016/j.technovation.2008.11.001

their experiences; in particular what factors, especially R&D expenditure, lead to success. High-tech products are the fastest growing segment of international trade and some 25% of exports from developing countries are in high-tech products (Srholec, 2007). Thus, access to scientific and technological knowledge, and the ability to exploit it are becoming increasingly strategic and decisive for the economic performance of countries and regions in the competitive globalised economy. Ernst and Lunvall (1997) had summarised that changes result from the combined impact of globalization and the spread of generic technologies, especially information technology, since they offer a large potential for productivity enhancement. Amongst high tech, ITC is particularly interesting (Hoffman et al., 1998), since Fathian et al. (2008) suggest that it changes the way companies operate. Lall (1996), for example, notes how the information and communications technology (ICT) sector is the source of more than 50% of innovation worldwide, but has an even greater role in developing countries. Rao (2001) suggests that this sector is fundamentally transforming the way business is run and has made it possible to globalize space, time and image.

Nour (2005) considers that the catching up of the newly industrialised countries is most likely attributed to the active development of science and technology. Indeed, the technology gap approach suggests that "catching-up" countries could grow faster than "leader" countries because they can exploit a backlog of existing knowledge developed elsewhere. We also note the concern of Archibugi and Lundvall's (2001) that knowledge creation, as well as exploitation, is also important. However, as Abramovitz (1986) points out, a country's potential for catching up can only be realised within three conditions: an endowment of resources, an adequate national social capacity and technological congruence. Accordingly, it seems that a well-developed ICT sector presents an important development opportunity for less-developed countries if the conditions are right. Examples of successful development include Latin America, Israel and the newly industrialized nations (Taiwan, Hong Kong, Singapore and Korea). But in each case there seems to be specific features: in Latin America, their preferential trade access and geographical proximity to the USA market combines with low labour force costs; for Israel, government intervention, a highly qualified human resources and high spillovers between companies, including multinational and start-ups, provide unique advantages. More generally, it has been convincingly argued (Yuhn and Kwon, 2000) that high returns to high-tech investment in developed countries may be partially explained by the general level of capacity in these countries. Archibugi and Pietrobelli (2003) thus suggest that the globalisation of technology offers new opportunities for development, but "that they are by no means available without deliberate effort to absorb innovation through endogenous learning". Less-developed countries may lack the highly connected social, economic and technological systems to diffuse and apply advances to such beneficial effect (Gu, 1999).

This overview, that ICT development can bring great benefits to developing countries, but only if certain conditions prevail, is the focus of this paper. It is set in the context that there is a well-established and rapidly growing body of research about the ICT sector in the developed countries, but a little empirical work has been done in the context of developing countries. This article intends to fill this gap. The purpose of this study is to address some of the questions raised about the ICT sector in Tunisia. In particular this article seeks to discern the main characteristics of the Tunisian ICT sector and then identify among these characteristics those that significantly explain "success" or not in ICT Tunisian firms. In the next section a brief description of the characteristics of the high-tech development is presented. Section 3 discusses the conditions deemed necessary for developing a high-tech sector, whilst Section 4 provides a description of the Tunisian context in which the ICT firms operate. Section 5 presents the research methodology and is followed by empirical data analysis. Section 7 presents the results of multinomial logit regression. Finally, Section 8 concludes the paper.

2. High-tech development

Lundvall et al. (2006) describe national, in their case Asian, innovation systems as in transition, inferring a qualitative shift driven by external transformation pressures and internal contradictions. This perspective on a shift towards "learning" and "globalizing" is a particularly useful understanding for catching-up countries, since it emphasises the growing importance of knowledge and learning and increasing international interdependence. Mani (2000) argues that innovation in developing countries is dominated by two global drivers. The first, the intensification of the globalization process, is spurred by the revolution in telecommunications, most obviously manifest in the increasing importance of global trade. The second driver is rapid technological change. Mani argues that changes are so profound that a new development era is gradually taking shape, replacing the old industrial era. But this new era presents the developing world with both challenges and opportunities. These challenges are accentuated by the fact that the development process requires more knowledge and entrepreneurial spirit to compete in an environment of intensified global competition. Yet Drori (2007) demonstrates that in an age of rapid globalisation and of intensifying global exchanges, the distribution of most world resources is highly skewed. For many, the global digital divide still looks more like a digital abyss. This divide is also true of high-tech industrial sector, where the developed nations seem to dominate.

This opportunity to develop a high-tech sector can be understood in Schumpertian terms (Schumpeter, 1934;