



The evolution of science, technology and innovation policies: A review of the Ghanaian experience



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ABSTRACT

Although there have been considerable past accomplishments in science, technology and innovation policy literature, our understanding of the evolution of government policies in these areas as a country transitions from one political regime to another, remains limited. This paper examines the issue within the context of Ghana, an emerging economy in sub-Saharan Africa, from 1957 to 2012. After a historical review of such government policies, we uncovered three key stages in the evolution of science and technology policy. These include the adoption of the “science for development” strategy and convergence of science and industrial policy from 1957 to 1966. This was then followed by the divergence of science policy and industrial policy from 1967 to the 1990s following the overthrow of Nkrumah’s government. The emergence of the “new dawn” from the 2000s onwards ushered in a new policy framework for national science and technology policy geared towards economic development. The study outlines a range of public policy implications.

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1. Introduction

Over the course of the last and this century, many countries have made the transition from one political regime to another and, in many instances, on multiple occasions (World Bank, 2011, 2013). These environmental upheavals are often accompanied by multiple shifts in governments’ science, technology and innovation (STI) policy. Although there has been growing interest in science and technology policy in developing countries (Padilla-Pérez and Gaudin, 2014), our understanding of how such government policy evolves as a country transitions from one political regime (e.g. democracy) to another (e.g. totalitarianism) and vice versa, remains limited.

Although some scholars have long recognised that not all shifts in government policies in these areas yield positive outcomes (Rothwell, 1992; Rath, 1990), there is a dearth of research on how the effects of science and technology policies unfold (see Martin, 2012; Morlacchi and Martin, 2009). Against this backdrop, the main purpose of this paper is to examine the evolution and effects of the government’s STI policy in the face of changes in political regime. The study focuses on Ghana as an exemplary setting and examines the evolution of STI policy from 1957, when the country gained independence, to 2012.

Since the second half of the 20th century, the country has made multiple transitions from democracy to military rule with varying impacts on wider industrial policy. Since it emerged from its colonial

past in the 1950s, the country has formulated and pursued policies that connect technology, science and innovation as foundations for economic development (Hilson and Potter, 2005). Therefore, Ghana offers a fertile environment to examine this issue. Such context-specific analysis has been found to provide robust and rich insights of the issue (Edquist and Hommen, 2008).

The paper makes two important contributions to technology foresight, industrial and research policy literature. First, although science and technology policy has been examined in past studies (Borrás and Edquist, 2014; Rothwell and Dodgson, 1992), the effects of changes in governments on such policies in the developing world have received limited scholarly attention. The study helps to fill this gap in the literature by developing a sequential framework which charts the evolution of national STI policy. The framework also helps to explain patterns in government policies and their underlying logics. Second, although technology and science drive economic development and growth in emerging economies (Dodgson, 2009), it remains unclear how governments reignite and reinvigorate technology and industrial policies. The study provides insights of the historical factors that drive a fundamental shift to reignite and reinvigorate such policies.

The rest of the paper proceeds as follows. First, a review of the literature on science, technology and innovation policies is presented. This is then followed by examination of the historical backdrop to the STI policy in Ghana. The penultimate section provides a detailed overview of the evolution of STI policy in the country. The final section outlines the implications for public policy formulation.

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2. Government policies and technology foresight: an integrative review

Scholars have long recognised that an effective STI policy occurs in tandem with collaboration of key stakeholders such as government, research institutions, industry and firms (Rothwell and Dodgson, 1992; Lemola, 2003). Such collaborations are required not only in formulating policies but also in ensuring implementation (Morlacchi and Martin, 2009). Broadly speaking, science policy entails investments in research and development activities, and development of human capital through education and training (Dodgson, 2000a). On the other hand, technology policy encompasses developing technological infrastructure to support the development and utilisation of existing and new technologies, whereas, innovation policy focuses on actions by public organisations to help develop capabilities and capacity of firms to innovate (Dodgson, 2009; Edquist, 1997).

Past studies have suggested that enhancing local firms' capacity requires resources, training and development as well as effective policies that remove business and innovation obstacles (Aghion et al., 2009; Borrás and Edquist, 2014; Morlacchi and Martin, 2009; UNCTAD, 2011b). National STI policy is an integration of these three dimensions towards fostering economic development and national competitiveness. It may evolve over time to reflect the needs of the country or changes in the political environment (Vitta, 1990; Rath, 1990).

There is mounting evidence that indicates that STI policy entails developing and shaping the “rules of the game” (North, 1990) to create conditions for innovation and technological development to flourish (Beerepoot and Beerepoot, 2007; Edquist, 1997). A growing stream of scholarly works indicates that the development of a national innovation system partly depends on quality of formal institutions such as law, regulations and government policies (Dodgson, 2009; Nelson, 1993). Lack of effective regulatory framework or clear government policies can stifle the innovativeness and development of domestic firms (Beerepoot and Beerepoot, 2007; Rothwell, 1992). Past studies indicate that central institutions such as national councils and agencies can help to coordinate national research and development activities as well as promote the development of science and technology (Vitta, 1990). Such supporting institutions and organisations are essential in equipping firms to perform at the technological forefront to develop and sustain competitive edge (Dodgson, 2009).

A stream of research has attributed the greater success of some emerging economies and newly industrialising nations in the Asia Pacific region to their ability to formulate effective science, innovation and technology policies, (Aghion et al., 2009; Dodgson, 2000a, 2000b; Vitta, 1990). These have helped to foster innovation. National policies of such countries are geared towards enhancing the capacity and capabilities of local firms to innovate and compete effectively in the global environment (Dodgson, 2009; Edquist, 1997).

Several authors have pointed out that indigenous firms' ability to take advantage of the policy environment to continually innovate can become a pivotal source of competitive advantage for the nation (Dodgson, 2009; Dodgson et al., 2008). This can be seen as a kind of technology foresight defined as the “process for linking science and technology more effectively to wealth creation and improvements in the quality of life” (Martin and Johnston, 1999, p. 655). It has the potential to provide countries with the route to formulate policies and strategies to develop capacities and leap to the next stage in their economic development (UNIDO, 2015). It also entails long-range, forward-looking activities by governments to help foster technology utilisation and consequently economic development (Chen et al., 2012). It is the concurrent attempt to explore the relationships between technology and science as well as harnessing technology to foster development and wellbeing of the wider population.

Technology foresight has also been identified as playing a pivotal role in wiring up the national innovation system to foster learning,

efficient utilisation of resources as well as meeting future challenges (Martin and Johnston, 1999). The technology foresight process is a mechanism through which future requirements, scenarios and priorities are defined in collaboration with stakeholders (Barker and Smith, 1995). Therefore, effective STI policy formulation and implementation require involvement of interested parties and changes in a party's circumstances are more likely to alter their level of resources, involvement and commitment (Edquist, 1997). Indeed, changes in government would not only affect the level of resources and commitments, but also lead to the re-prioritisation of policies with the wider economy. Changes in government can disrupt previous government policies and even destroy the foundations laid by the previous regime (see Ayensu, 1978).

Based on the above overview, technology foresight can be achieved through effective linkage of national STI policy, as illustrated in Fig. 1. The figure demonstrates a unified approach for government policy to help foster the development of local innovation and national competitiveness. Although governments have historically sought to improve the conditions for research and innovation activities to flourish, at times the government can also become a barrier to development in these areas. In this study, we seek to illuminate our understanding of this issue by examining the evolution of STI in Ghana.

3. Historical background: science, technology and innovation policy in Ghana

In the middle of the last century, Ghana emerged from colonial rule and experienced various degrees of economic and political upheaval. Since the end of British rule in 1957, the country has adopted various technology and science policies geared towards making it a leader in these fields. The role of science and technology as panaceas in Ghana's economic underdevelopment can be traced to its founding fathers including Kwame Nkrumah, who set out a coherent policy of using universities and tertiary institutions as engines for economic development. The formulation of science and technology policies started with greater intensity immediately after independence to help foster indigenous innovation and development.

In 1957, Ghana's manufacturing share accounted for 7.4% of GDP and was on the verge of modern industrialisation (Darkoh, 1973). By the early 1960s, Ghana was at the cutting edge of modern technology education, however, its place in the world faltered after this period. However, from 1973 to 1983, the industrial sector shrunk at an average rate of 3.5% per annum (Adei, 1990). By the late 1970s, manufacturing was on the verge of collapse with devastating effects on industrial development. One possible explanation was that over the years, the government adopted a politician-led strategy which had little link to industry or educational institutions. Over the years, illiteracy and limited access to information communication technology have become major obstacles to economic and political development (Opoku, 2004).

In the last two decades, Ghana has emerged as one of the most stable democracies in Africa with a fast-growing economy and a Gross Domestic Product (GDP) growth of 16.30% in 2011 (Boso et al., 2013). In 2010, the country was declared a lower middle-income country, which was a testament to its economic and financial reforms, political stability and limited ability to utilise its natural resources for development (African Business, 2015). One possible explanation for this is the increasing liberalisation and dismantling of loss-making state-owned organisations. Over the years, the establishment of fast-track courts with the aim of enhancing the speed and ensuring the efficient resolution of commercial disputes has helped to provide assurance and confidence in the legal system (African Business, 2015). These efforts have helped to attract foreign investors. In the first decade of this century, there was a major change in government which precipitated a shift in government policies towards the promotion of science education and local innovations.

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