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Executive Summary

Building the National Technological Base and the Local Manufacturing of Productive Machines and Tools in Egypt

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Introduction

The developing countries, including Egypt, endeavor to build up their industrial capabilities by establishing a modern, well-diversified and competitive industrial structure. This could be achieved through strengthening the national technological base especially by making good use of the mechanisms made available by the fourth industrial revolution.

The major interest of the current research is to lay the basis for establishing an evolving Egyptian national technological base enabling the Egyptian economy to produce and employ recent, sophisticated, and highly productive machines, instruments, and tools. This is tackled, in the current research, through four chapters the first of which underlines some necessary remarks concerning the importance of building up a solid and ever-growing technological base in Egypt with special emphasis on micro-electronics. The second chapter deals with a sort of input-output analysis explaining the current situation of the machines and tools industry in the inter-sectorial relationships in the Egyptian economy. The third chapter reviews some sectorial studies concerned with the local production of machines and productive tools that are closely related to the areas of artificial intelligence, agricultural intelligence, and medical appliances. Finally, the research concludes with some analytical presentations concerning the experiences of four countries: China, India, Brasilia, and Germany. Some lessons are deducted from these experiences.

Research Objectives

1. Highlight the prime importance of building an original national technological base in the comprehensive development model of the developing countries in general and Egypt in particular.
2. Highlight the importance of developing the sector of productive machines and tools within building up the technological base; given the prime importance of this sector to the technological base as a whole and its self-evolution according to the indicators of sustainable productive capacity, and relatively equitable commercial exchange with the foreign countries.
3. Stress the role of the microelectronics industry in establishing and developing the national sector of productive machines and tools.
4. Emphasize the prime importance of this sector in the Egyptian industrial structure according to the intersectoral relationships as indicated in the input-output tables.
5. Introduce an applied approach to the fabrication of productive machines and tools in some economic sectors of special importance from the viewpoint of the current study. Three sectors have been chosen: artificial intelligence in the industry, numerical technology in agriculture, and the fabrication of medical appliances, given that these sectors are of prime importance to the development and dealing with some fatal crises (such as the Coronavirus pandemic).

6. Acquire some relevant international experiences. Such experiences are chosen, as applied cases, according to some criteria like technological pioneering, especially about the world industry of productive machines and tools.

Data Collection and Analysis

1. Making use of the input-output analysis as a principal tool for comprehensive analysis of inter-sectoral analysis in general and inter-industrial analysis in particular.
2. Systematic interpretation of the economic sectors' situations based on the use of systematic data collection and analysis according to explaining hypothesis to reach conclusions supporting or denying hypothesis. This method has been tried by applying it to the industrial sectors (the role of artificial intelligence), agriculture (digital transformation), and branch industrialization (medical appliances).
3. Comparative analysis of the international experiences, theoretically and practically, concerning the practices of international economic relations as clarified in the relevant literature in English and Arabic.

Findings

1. The Egyptian economy possesses promising capabilities in the medium and long term. These capabilities are the geographical position, the developed infrastructure, and a highly talented labor force that endows Egypt with possible promising comparative advantage in the regional worldwide markets in some of the economic sectors. Accordingly, paying attention to manufacturing productive machines and tools is part of the interest in building up the national technological base.
2. There are some challenges facing the process of localizing the high technological developing industries. Examples of these challenges are depending on importing the production inputs and the capital goods, strictly controlling the diffusion impact of the technologically highly developed industries even if such foreign investments are implanted in some developing countries. It is also noticed that there are no systematic linkages between industry and the universities and research centers as well as the disinterest of many Egyptian companies in having sections specialized in R&D in addition to low or even negligible investments in such activities coupled with almost negligible government budget expenditure for this purpose.
3. Sectoral studies indicate that the availability of the principal technology of intelligent industrial systems, via applying the technologies of artificial intelligence, is very conducive as regards learning and improving performance and better cooperation between human forces and machines. However, it should be noticed that human skills are irreplaceable in dealing with tastes and unexpected changes in human needs.
4. International experiences are a great source to learn from, especially the systematically linking industrialization with the continuous effort of R&D and

adopting programs to develop the production of machines and tools used in the different industrial activities. Such an experience is of importance for Egypt as well as any country that looks for catching up in development in general and industrialization in particular.

Recommendations

1. Devising and adopting integrated strategy implementation and deeply rooting the industries of the high and modern technological components. This might require intelligent measures to protect such industries for a certain period to be able to compete with similar industries targeting the Egyptian market.
2. Developing and motivating efficient industries in the sector of producing machines and productive tools that are characterized by dynamic developments and high production capacities.
3. Undertaking development from the viewpoint of intelligent cities and intelligent transportation and movement systems in such a way that benefits from the achievements of the new industrial revolution and cops with its prerequisites and new technologies. The industrialization sector is quite suitable for making use of and developing artificial intelligence which proves to be highly beneficial for the necessary developments of the fourth industrial revolution.
4. Studying and implementing the means of enhancing the efficiency of technical education through establishing well-equipped technical schools, especially in the areas of new industrial agglomerations, and paying due attention to providing sufficient financing to these developments.
5. Developing industrial/technological partnerships with the countries having eminent expertise in fabricating productive machines and tools like India and Germany.

Policy Impacts

Industrial policy

It is necessary to restructure the industrial sector in general and to pay great attention, in particular, to developing the industry of productive machines and tools.

Trade policy

Gradually applying the import substitution in the area of productive machines and tools. This could be the first step to exporting such machines and tools.

Scientific-technological policy

Efforts should be focused on the activities of basic and applied research, especially in the areas of engineering research and applications and how to organize and implement the design and production processes.