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ECONOMICS OF RESEARCH AND DEVELOPMENT :

" A THESIS PRESENTATION"

BY : OUKIL M.S.

In November 1989, a ph.D thesis was defended before a board of examiners at the University of strathclyde, in Glasgow, Grest Britain. In what follows, the author would like to present a broad summary to the reader in Algéria . The objective is nothing else than the dissemination of knowledge in the field of economics of technological innovation.

Title of the thesis

" The function and system of industrial Research and development in Algéria".

Synopsis :

The thesis explores the effectiveness of research and development (R & D) in the industrial sector of Algéria It argues that the out come is not high, and seeks esplanation at the level of the firm, which is the point at which any system of R& D has to make serious impact if it is to be efficient. The failure of R&D :cto greatly boost productivity is documented by data relating to investement and output in the various industrial branches. This failure could have many (and elusive) causes, including inadepuate funding and misallocation of resources. The focus here, however is on the net work that links R & D to industrial practice nnd the seridousness with which firms handle the issue of R & D and innovation. They are found weak, badly operating and lacking, and - it is suggested - improvement in this regard is a sine qua non of the effective application of science and technology (S&T) to development ends.

Algéria which is the case under study has made substantial efforts in S & T . Afew years ago , it had completed the administrative structure by setting a highest central body under the honorary patronage of the president of the Republic.A concrete autcome of those efforts is the build up of a insignificant capital formation which is used to implement important R & D programmes in different sectors an industries.

But R & D as an economic activity does not seem to be efficiently undertaken. The général impact on industrial productivity is so small that it

is difficult to trace and prove. Ambitious as it is at the macro-level, Algéria's S & T policy has even lagged behind the strategy of intensive industrialisation , which relied on massive import of modern technologies. After more than two decardes of development experience, the negative productivity in the industrial sector has sustaned the above inefficiency.

The study is an attempt to examine this state of affairs by considering the effectiveness of R & D functions and network at the justified by the fact that it is at the productive unit that the impatt of R & D is felt. Indeed, in carrying out their productive activities, firms do face technical difficulties and it the solving of these, that renders R & D crucial in the development process. Thus, the effectiveness of sectoral and national R & D systems and S & T policy could be judged on basis of micro-economic results.

Three groups of factors are identified as the main elements of a coherent R & D system : Organisation and efficient management, linkages and incentives. Closely related to the study of the system is also the handling of R & D function at the level of the firm. In some firms. such function may be formalised ; In others it may not. In this case, informal R & D or innovative tasks could possibly take place. These-it is stressed in this study-are not of less importance than the forma ones.

The investigation uses data collected from a field work in Algéria. The major part of it consisted of a sample survey covering 98 public and private industrial entreprises including three applied research centres. The coutcome from the inquiry is, however, not quite satisfactory. Interviewed firms have not supplied with all necessary information, ant the national body in charge of S&T was unwilling to co-operate. Secondary data, on the other hand, are not fully or easily available. This data constraint has, hence imposed recourse to extrapolations and assumptions.

The main objective of the study is to clarity and explore the idea of remoteness of R & D activities from industrial practice with refernce to a developing economy. In this context, I have proposed that, R & D remoteness could be defiened as lack of relationship

of three types : a) between R & D effort and seriousness with which it is undertaken within the firm ans with the rest of the production system ; b) between R & D or innovative effort and productivity, as part of the overall industrial performance ; And c) between industrial firmq and other entities , which are capable of contributing to solve problems of production on the basis of strong external interactions and linkages. To test the first relationship, two indices were used : innovation frequency and seriousness. The other two relationhips are enlightened using comparative and multipled regression methods.

Structurally, the thesis is presented in six chapters. Chapter I is introductory and covers the background to the issue, the issue itself, the theoretical and empirical contexr of the study, the scope and limitations of the study and its organisation. Chapter II presents a broad economic background to the study. It historically describes Algeria's economic development and discusses the adopted strategy Chapter II gets a closer look into the country's industrial and technological development. Chapter IV sets the conceptual foundation for the study and the hypotheses to be tested. The empirical part is in two chapters ; Chapter V includes the analysis, computations and results : And chapter VI presents a summary of the discussion theme and main conclusions and offers some recommendations.

In developing the framework, I mainly point out the following : that innovation is not only formal, but also informal ; that incremental innovations are not only of no less importance than the major ones, but also necessary ; and that lack of innovation institutionalisation, and weakness in R & D network could explain the slow development of innovation capabilities in the country in question.

On this basis the study strongly argues for more concern at a micro-levell, in particular, about the coherence and effectiveness of both R & D functions and systems : The former referring to mainly efficient management of R & D activities and capabilities, and the latter to the network of interactions or linkages and incentives, both inside and outside firms. Such concern, it is suggestec, is a basic and urgent requirement for achieving a sound level

of technological development, and, consequently a prerequisite for technological independence, or rather self-reliance, The phase, so much officially and publicly being referred to in Algéria as "l'apres petrole" - i. e, the phase after the country's oil will run out - is a hot issue. However, if in recent years agriculture has been justly allowed to gradually restore its important place in the national economy , it still remains that the present industrial apparatus should be geared towards greater efficiency, in all its production units and activities including R & D .

The study presents the following four main conclusions : First, that the undertaking of a heavy industrialisation in Algéria has resulted in technological capabilities, though to varying degrees in production, investment, engineering and innovation However, those of the latter, in particular, are not only much concentrated in the heavy industry sub-sector and low with respect to innovation and exports. but also that relevant effort is not highly interactive with universities and research centres.

Secondly, that what the country's overall R & D , or technology policy and system suffer from are lack of pragmatism and coherence. In other words, efficiency and linkages are not yet properly accounted for. A consequence is that relevant effort may - prima facie- look impressive, but when scrutinised, it could be found not standing qith industrial performance.

Thirdly, that industrial R & D activities, in Algéria , do not yet present real signs of being efficiently integrated within the industrial production system as they are supposed to be. The relatively greater growth of the heavy or capital goods sector is yet due to employées experience and learning-by-doing, through the continuous confrontation of various internal and external pressures and difficulties , rather than to a cost-effective in - novation effort by relevant firms. This could, perhaps, suggest that in an industrialisation effort-from one phase to another, but gradually rather than jump into the front line at once.

Fourth, and last but not least, that at the firm level, the R & D function has taken time to be given its importance in the algérien industry. This may be expected as, on the one hand, innovation capability does not

usually precede investment and production capabilities, and on the other hand, algérian public enterprises have long been burdened with various social activities and responsibilities. In any case, there is no good reason why firms do not seek and exploit viable ideas, or innovations however small, and which may be even informally made or suuggested.