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"Notes on Transfer of Technology by Nationals Living Abroad, With Particular Reference to Algeria"

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Abstract:

It is well known that transfer of technology can take place by different means, methods and ways. In Algeria, economists, social scientists and others have all made large contributions. Notwithstanding, the contribution of national scientists and technologists who work abroad remains not enough discussed. In the literature, this question is often referred to as the "brain-drain".

Of course, various reasons push people in general to immigrate or leave them staying abroad, when they have a chance to be there. In so far as scientists and technologists are concerned, they are more valuable to their countries of origin. This is because their responsibilities and possibilities of contributing to national development are much greater. For this particular reason, some governments of developing countries have recently begun to look more seriously to the issue.

This paper presents some modest notes about this particular area of the debate. It particularly concentrates on the case of Algeria and considers the conditions and ways by which our human resources could contribute efficiently to its development.

Key words:

Technology transfer;
Science & Technology (S & T);
Research and Development (R & D);
Human resources;
Development;
Technological development;
Algeria.

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Introduction

Technological development [1] is a process which involves an extensive use of scientific and technical capabilities in different sectors of an economy. Very sadly, many developing countries have been suffering because of the very bad management of their scientific and technological stock [2]. In some, if not all, of these countries, national scientists, technologists, inventors and innovators [3] are in one or more of the following situations:

- Underutilized in terms of overall potentialities;
- Little considered as far as social conditions and participation in decision-making are concerned;
- Have been discouraged to return from abroad, or,
- Above all have been somehow forced to immigrate.

In the particular case of Algeria [4] these last two reasons seem, at last, to have recently gained some attention from the authorities [5]. The clearest indication of that is the official organization of a first international forum on the question [6].

As regard the broader issue of Science and Technology (S & T), the main questions to ask, in my view, are the following:

First, is the above mentioned action a simple political game, or is it a serious decision reflecting good vision and policy?

Second, has there ever been a serious management of the national S & T policy? In other words, has Research and Development (R & D) in Algeria been properly managed at both macro- and micro-economic levels?

Third, has technology transfer (TT) been undertaken within an intelligently elaborated system and strategy?

Fourth, as the Algerian economy is moving towards a market economy type, what that should imply in terms of S & T in general, R & D and technological innovation in particular?

In attempting an overall answer to these important questions, I shall proceed as follows: In the first place, I will explain why it is crucial for any country, including Algeria, to use all its possible human resources, wherever they may live or work; In the second place, I will show the weaknesses of the Algerian research system and its negative impact on effectiveness; In the third place, I will, on the one hand, suggest the main ways to get out of the dilemma and maximize the socio-economic benefits, and on the other, discuss the requirements for a practically successful transition.

I: Reasons for implication of all national capabilities.

There are many reasons for the necessary implication of all [7] national scientific and technological capabilities [8] in the development process in its large sense [9].

One, because there is a real need for their involvement in order to maximize the benefits, due the incapacity of local human resources, industrial and other structures [10] to coop with all the needs, difficulties and problems;

Two, because they are, or should be, more aware than foreigners, about local conditions, environment, culture and people [11].

Three, because the majority, if not all, national human resources are educated and/or trained using public funds [12];

Four, they should have some moral engagements [13] towards their nations and peoples [14].

Five, because they represent a sort of "hidden" source for scientific and technological knowledge, as well as information and experience [15], so much needed for problem-solving and decision-making.

However, the paradoxical issue, to pinpoint here is the divergence between research problems, which national researchers established abroad work on, and those which the economy and local firms need to deal with. In general, foreign scientists and technologists, who are engaged by universities and industries in the developed countries, work on issues and problems proper to these countries [16]. Not less critical is also the general tendency for developing countries to follow up the industrial world exactly in the same way, despite that their policies, resources and objectives are, or should be, different.

Hence, the task in the process of "technology sending" [17] by nationals is not simple; A serious point which should, therefore, be dealt with is the clear understanding about what should be transferred and how. An underlying example is the difficult selection or search for useful projects and solutions which could be adequate at home [18].

II: A deeper look into Algerian R & D system's weaknesses.

Historically, Algeria's R & D [19] is born well before its independence. The then objectives were mainly to serve the occupant's local interests as well as those in the main land [19].

After the independence, the choice of a socialist road for socio-economic development has led to the establishment of a large public sector including the field of R & D [20]. The main characteristic of such research has been rather more political than scientific or technological. For, the main task was to create an ability to imitate research efforts as in the successfully industrialized countries. And, the aims were to quickly catch up with them, and therefore to rapidly close the so-called "technological gap".

Since 1971, the first elements of a national S & T policy were laid down. The main driving vectors of this policy are as follows:

A- Engagement in ambitiously elaborated programmes of scientific research, both fundamental and applied;

B- Recourse to massive transfer of up to-date technologies from various countries, mainly the developed ones.

C- Substantial investments in education and training, locally and abroad, particularly at post-graduate level.

A critically objective view of these axes would, indeed, allow arriving at an important conclusion; that, the impact of such a policy on production and productivity has been totally and practically overlooked [21]. Indeed, and for a long time, industry -not to say the whole economy-, on the one hand, and scientific and technological institutions, on the other were quite apart from each other. Particular reasons, such as the flow of petro-dollars and the distorted vision [22] of the then authorities made that quite possible.

Later on in the 80's, some positive reforms [23] have occurred but mainly on the administrative side [24]; Institutionally and gradually, the structure become, consequently, quite complete and advanced; This is particularly witnessed by the established of many research centers, units and laboratories at both macro- and micro-economic levels. Add to that, large amounts of equipment and tools were imported and allocated to these structures. Nationally ambitious programmes have also been elaborated, and an important number of post-graduate students have been trained both locally and abroad.

However, against all that, the conditions in which research has been carried out are alarming. To start with, it is a fact that Algerian researchers themselves are not yet properly managed and considered [25]. This is probably the real reason which pushes particularly highly trained people to immigrate. Besides that, communications between researchers themselves are rare [26]. Linkages between research centers and industry are also too smooth or non existent [27]. Add on top of all that, scientific equipment and tools are badly allocated, technically and economically obsolete [28], or far from sufficient and appropriate.

In brief, the important weaknesses could be summarized as follows:

A= Policy prescription is too much ambitious. This is reflected by the neglect of the direct and urgent impact on the economy. It is also clear by the disregard of the accumulated experience of the local industrial labor force;

B= Disfunctioning of the relevant network or system: All different linkages are non existent or badly working;

C= Clear misallocation and misuse of resources.

III: Efficient ways of contribution by immigrant capabilities.

The first remark in this context is to argue against the way with which some governments deal with the issue. In Algeria for example, politicians and administrators in charge of higher education and scientific research seem to view the matter too much simple; in their search for a solution to the crisis, they made the decision to invite a sample from the national scientific community living abroad for

discussions with some of their local colleagues. In the agenda, the objectives aimed at were:

1- Allow the local and outside participants to exchange views, ideas and thoughts;
2- Create an official institution for Algerian scientists and technologists;
3- Make the invited participants aware about the problems facing research, higher education and the economy at large;
4- Urge them to make suggestions about possible transfer of various technological elements [29];

The gathering, which lasted for a few days, has however ended by the birth of an important institution [30]. This, it is generally hoped, will help in easing scientific and technological contribution of Algerians living abroad towards their country.

As such, these actions seem to reflect a naive way of thinking and acting about how it is possible to take seriously in charge the question of S & T in the country. Making it economically productive and socially useful cannot simply be a matter of institutions, funds and import of technology, be it equipment and/or knowledge. There is a real need for pragmatically elaborated strategies as well as appropriate macro- and micro-economic management. On this point, views and recommendations of scientists and specialists should necessarily be taken into account.

III.1: Conditions for elevating the degree of TT success.

From a point of view of a realistic S & T policy, it is essential that the approach should be global [31]. For, when there are gaps within, between the components [32] and with the environment successful results can hardly be realized.

Hence, the first and basic condition, for a useful and serious contribution of national scientists and technologists working abroad, is for the government to make the existing research system work and work properly [33]. It is indeed completely inconceivable to call for those nationals, while local research and researchers suffer from various and serious problems.

Another important or perhaps basic condition is to lay down a clearly good policy and an appropriate strategy. This would call for a number of things; Among them, one could mention a serious revision of the actual global S & T policy and its targets; An objective identification of priorities; A proper use of all capabilities in both the public and the private sector; And a determination of adequate means and resources.

Also, not less important is the legal aspect concerning technological innovation and import [34] of technologies and knowledge. In various sectors and areas, there is a serious absence of inadequacy of laws and administrative procedures [35]. Worse, there is also a lack of managerial consciousness [36] about the issue.

If, on the other hand, local scientists and technologists suffer from shortage of and easy access to up-to-date knowledge, it becomes necessary to create new conditions or procedures for recycling. The creation of a review [37] for S & T, involving

particular fields and specialties needed for local use, would consequently be of great help.
On the external front, it is essential to determine countries or groups of countries - both developed and developing- with which relations must be established or reinforced [38]. This would also include an inventory or list of all and potential contributors in different areas of S & T, also channels, mechanisms and ways of export towards Algeria. Most important of all is a follow up of these exports and their positive impacts on the Algerian economy and society. The government would then have the responsibility of enhancing and orienting efforts and initiatives.

III.2: Conditions for useful reintegration.

Generally, success in socio-economic development depends on the good use of technology wherever it comes from [39]. In this context, the transition of the Algerian economy into a competitive environment would not be successful if it ignores three important elements:

First, good management of technology [40].

Second, restructuring the economy and thus, creating the necessary conditions for real competitiveness [41].

Third, openness on markets and investment [42].

As far as national scientists and technologists and their contributions are concerned, the new economic structure and environment would call for the following conditions:

A: within the public sector:

One, Appropriate social consideration. This would imply adequate conditions of housing and earning;

Two, Good affectation of capabilities. This means work according to the field of specialty and devotion;

Three, Incentives to suggest, do and elaborate ideas and thoughts.

B: within the private sector:

One, Encouragement of investment in the field of science and technology;

Two, Financial assistance for nationals to exploit their patents;

Three, Freedom of import of technically and economically appropriate technologies [43].

Summary and conclusion.

To summarize the above modest notes about S & T transfer to developing countries with particular reference to Algeria, it can be said that the benefits, which can be

withdrawn from the contribution of nationals, cannot be straight forward. Recourse to those human resources is needed subject to a serious revision of various things as discussed. In any case, objective plans and continuous efforts are necessary.

The main conclusion is that the contribution of national scientists and technologists cannot be fruitful, if local socio-economic conditions and management remain without reexamination and remodeling. Consequently, the transition towards the market economy would be less successful and fruitful than expected.

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Notes:

[1]: In the sense used by Dahlman, Ross-larson and Westphal (1987), which refers to the building of four types of capabilities: investment, production, innovation and engineering.
[2]: Including tangible ones such as officers and staff, and non tangible ones such as knowledge and experience.
[3]: Both formal and informal ones.
[4]: Not necessarily in the country where they did the post-graduate studies.
[5]: We make particular reference to this country as one the five countries of the Maghreb Union. Some facts as well as conclusions would apply to the other four countries: Morocco, Tunisia, Mauritania and Libya.
[6]: Including mainly the Ministry of Foreign Affairs which has played a key role.
[7]: 1st Forum of Algerian Scientists: 14-16 August 1994, Algiers.
[8]: Whatever their levels are and wherever they may live and work.
[9]: Without under-estimating other types of capabilities such as trading and investment in particular.
[10]: Economic, social, industrial and cultural.
[11]: Including mainly firms and applied research centers.
[12]: Since, there seems to be no accountable economic and technological development if people have not either been involved or taken into account. This is in brief the social or human aspect of development.
[13]: Education in Algeria has been since the independence free to all pupils and students at all levels.
[14]: The great majority of educated Algerians abroad in due to national grants and scholarships.
[15]: From a justice point of view, it may not be acceptable for some people to be sent abroad for higher education or training, while others do not if they satisfy the same criteria.
[16]: Here, reference is particularly made to industrial men working in different firms of the developed world. An example is our nationals working in the automobile industry in France; The experience, of those who returned home in the last few years, has been of great importance for the mechanic industry in Algeria.
[17]: Note for instance that Algerian post-graduate students prepare their Master, Ph.D. and Doctorate degrees on themes that are often of interest either to supervisors or industry in the countries where they study. This is particularly true in engineering, chemistry and technology in general.
[18]: As opposed to technology transfer by foreigners.
[19]: This could be a very controversial question between the two parties concerned, i.e., national scientists/technologists and the government. A project could be useful and appropriate from point of view of engineers and managers, but not necessarily from that of the government..
[20]: Here the term development means transformation of scientific knowledge into concrete products and not technological development as it is confused by some writers: Bessalah (1994) meaning technological progress and capability building.
[21]: The main and best example is in the fields of energy and health: The existence of the 'Centre Nuclèaire' and l'Institut Pasteur' well before the independence in 1962.
[22]: Note that all pre-independence scientific research institutions were nationalized, particularly since 1967.

[23]: In our thesis, we have made it very clear that a S & T policy or programme has no meaning if it does not aim at creating positive impact at production points.
[24]: Here, one must make the following point clear; that politicians of the post-independence have all been fascinated and convinced by their advisers' wrong views and thoughts, namely that linkages and interactions between S & T and economic sectors will come about later on in the future and automatically.
[25]: What witnessed an ambiguous vision in these reforms is the unstable separation and joining between education, higher education and scientific research.
[26]: The sector has passed through various appellations: HCR (Haut Commissariat à la Recherche), SER: (Secrétariat d'Etat à la Recherche), MDR (Ministère Délégué à la Recherche) and lately MESRS (Ministère de l'Enseignement Supérieur et de la Recherche Scientifique).
[27]: Absence of an adequate legal status.
[28]: It is most ridiculous that in general contacts and acquaintance between national intellectuals take place abroad, due to lack of local scientific opportunities.
[29]: See our thesis, details at the end of this paper.
[30]: Apart from certain fields, such as nuclear energy, this has been reinforced by new reactors.
[31]: This could be equipment, machinery, tools and or knowledge.
[32]: "Association of Algerian Scientists".
[33]: To remind you what I have said previously that it is the foreign aspect of the question that has particularly gained some attention. See the above introduction.
[34]: Mainly: local R & D, import of technologies and scientific education.
[35]: A system which is really broken down: see Oukil (1992) and Bessalah (1994).
[36]: One could very well ask about who is really in charge of technology import in Algeria? In other words, why a national institution for that purpose has not been created?
[37]: See particularly Riehl (1992) and Hamidi (1993).
[38]: See our article (1993).
[39]: Such a review would also help resolve another critical problem; that of "equivalence" of degrees hold by nationals coming from abroad. Indeed, apart from degrees and obtained from France, all other foreign degrees are subject to examination and control. Until very recently, this procedure takes very long time, not to say years.
[40]: Note here that in Toulouse (France) a team of researchers has been charged by the CEE to study the national R &D systems in the integration zone of UMA: Maghreb Arab Union.
[41]: See Djeflat (1991).
[42]: Both locally produced and imported, whatever its complexity and simplicity.
[43]: The process of liberalization started in the last few years has led to the emergence of an important force of speculators and commercial activities. In theory, competitiveness is real when it involves technological innovation; Ref. Porter (1990) and Cooper (1993).
[44]: Not only foreign investment but also that of national immigrants: industrialists and business men in Europe and elsewhere.
[45]: The 'Code des Marchés' of 1966 - which stipulate that only new (not above 3 years old) are allowed -should be revised.