



The place of the uranium industry and prospects for creating a growth pole in Niger

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Abstract

With the prospect of exploiting the Imouraren uranium deposits in the north of the country, this article looks at the contours of an industrialization strategy based on the creation of a growth pole in this part of the country. Firstly, the paper shows how the concept of a growth pole has evolved into that of a competitiveness pole. It then examines the dependence of the Niger economy on uranium mined by the two major French companies since the early 1970s. Drawing lessons from the unequal sharing of uranium rents and the nature of this mineral, it proposes the creation of a growth pole that could evolve into the establishment of a Niger cluster. The success of this industrial development strategy requires the involvement of all competent partners from both North and South in the field of uranium mining, sales, and purchases. Such a policy aims to reduce the economic and socio-political crises that affect the evolution of economic parameters. It can be generalized to put Niger's territories in competition with each other.

Keywords: Growth pole, competitiveness pole, uranium, uranium income.

1 Introduction

The rapid transformation of the global mineral resources market has been accelerated by the surge in crude oil prices in recent years. The far-reaching effects of this situation have prompted Kasse (2008) to state that “production systems, industrial, commercial and human activities are based on a model of energy consumption based on non-renewable fossil or mineral resources”. Black gold prices soared from \$32 a barrel in March 2003 to \$145 in July 2008, before dropping to \$35 in early 2009. Today, they have resumed their upward trend, rising above the \$100 mark in September 2023 (Le Monde online of September 25th, 2023). This oil bubble helped push the global economy into the abyss (Stiglitz, 2010). It has greatly encouraged the search for alternatives to fossil fuels, with renewed interest in nuclear power.

From this perspective, African uranium-producing countries such as Namibia and Niger are highly coveted by major foreign mining companies, particularly from developed countries. The decline in uranium stocks worldwide and the renewed interest in nuclear power since 2005 coincide with the end of life of one of Niger's main mines, operated by the Compagnie Minière d'Akouta (COMINAK, created on June 12, 1974 and closed on March 31, 2021). Niger, a country plagued by poverty traps, is very concerned about the rapid

resumption of uranium production and exports. For this reason, prospecting for this mineral has gained momentum since 2006, with the government issuing six prospecting licenses to AREVA NC Niger (now ORANO) for the Imouraren deposits and to China National Uranium Corporation (CNUC) for the Teguida deposits, all located in the north of the country (Dodo, 2021). Production from the Imouraren deposits, which were due to begin in 2013 at an annual rate of 5,000 tonnes for 35 years, according to data from Niger's Ministry of Mines and Energy (2008), is likely to make this new mine the largest in Africa and the second largest in the world. However, it should be noted that ORANO has postponed the commissioning of the Imouraren deposit until 2028, following the weakening of uranium prices on the world market after the Fukushima nuclear disaster in Japan in 2011.

Does this favorable environment, combined with a rise in the price of this mineral since 2003, mean that all other things being equal, the country is likely to be attractive to West African countries in the medium term? How can Niger's economy diversify from uranium energy sources in a world of imperfect competition, asymmetric information, and market practices largely dominated by multinationals backed by powerful governments? Through what policies can this opportunity enable Niger to embark on the virtuous path of sustained growth as a response to the recurrent food and socio-economic crises that the country has been helplessly enduring since the 1970s? The aim is to highlight, ex-ante, the place of the uranium industry in Niger's economy, and to examine, ex-post, the possibilities for creating a Perouxian cluster of regional growth, or even competitiveness, around the uranium sector, with, of course, all the limitations associated with production techniques, processing, technology transfer and the management of waste and radioactivity. The construction of this cluster, with the close collaboration of external partners, would be aimed at maximizing the value of this strategic and exhaustible raw material, with a vision of creating the conditions for the country's gradual industrialization. This is why we have decided to take an in-depth look at the situation in this study.

Following the introduction (1), the main body of the article (2) comprises three chapters. The first (2.1) analyzes the transition from the growth pole to the competitiveness pole, the second (2.2) examines the place of the uranium industry in Niger's economy, and finally chapter (2.3) attempts to study the conditions for creating, operating and animating a growth pole around uranium deposits, in the perspective of instilling an industrial development dynamic likely to ultimately reduce the perverse effects of the various socio-economic shocks Niger regularly suffers. The closing conclusion of the article is noted (3).

2 Analysis of uranium's contribution to the economy and industrialization through the creation of a growth pole in Niger

This section first describes and analyzes the process that led to the creation of the growth pole, before examining the place and contribution of uranium in the Niger economy since the 1970s.

2.1 Genesis of the transition from growth pole to competitiveness pole

Historically, the notion of growth pole was introduced into economic literature by François Perroux in the 1950s. It complements the industrialization approach based on industrial districts studied in the 19th century by Alfred Marshall (1890), whose work is commented on by Coulet and Banko (2000) and Navarin (2012). In other words, the concept of the growth cluster long preceded that of the competitiveness cluster, an expression used to designate the model of territorial network organization based on the knowledge economy. Indeed, since the early 1980s, this “notion has become an obligatory frame of reference for

most developed countries, but also for many developing countries” (Sbirà, 2004); hence the idea of taking a critical look at the notion of growth pole in the case of developing countries (DCs).

2.1.1 The growth pole as an industrialization strategy for developing countries

François Perroux (1955) and Albert Hirschman (1958) respectively demonstrated that development is inherently polarized or sequential, calling into question the industrialization strategy based on the balanced growth model (Rosenstein-Rodan, 1943). The work of François Perroux provides an excellent tool for analyzing growth poles. This author defines growth as the sustained increase, over one or more long periods, of a dimensional indicator, net aggregate product in real terms. The growth of this aggregate is reflected in the appearance and disappearance of various activities, and very different growth rates from one sector to another. Growth is therefore not balanced; it does not appear everywhere at once; it manifests itself at points or poles of growth, with varying intensities (Perroux, 1955). The Perrouxian pole of growth is indeed a source of non-proportionality. The resulting growth is unevenly distributed and spread around and between centers of concentration and agglomeration of the means of production.

Hirschman (1958), for his part, defends the thesis that growth is the product of a sequence of imbalances that spread throughout the economy. The effects of investment are manifold: multiplier effects on income, effects of increased production capacity, complementarity effects, and linkage effects. Upstream, the industry generates demand for intermediate consumption. Downstream, a demand of the same nature arises in the case of an industry that supplies goods to other branches. State intervention is required to rectify the interplay of economic mechanisms spontaneously governed by impersonal market forces, to create hotbeds, or even dynamic poles, of industrialization. All other things being equal, “the positive externalities at the heart of this industrialization strategy manifest themselves in proximity effects between firms” (Kern and Larue 2010: 21). When these effects occur in a given territory, they neutralize the disadvantages of distance, which most sub-Saharan African countries suffer from.

The crisis of the Fordist production model in the 1970s and decentralization movements helped revive analyses in terms of industrial districts, a Marshallian concept that designates a production system segmented into networks. Marshall (1890) put forward the phenomena of external economies and agglomeration, industrial atmosphere, and economy of proximity to explain the formation of districts. Districts are characterized by the existence of small, specialized companies operating in a given territory, a territory marked by relationships between human actors rather than between firms. “Recent rediscoveries of Schumpeter’s ideas, because of their explanatory relevance to the current economic and technological crisis, have made it possible to identify growth breaks accompanied by phases of expansion and recession” (Larue, 1991:30). These are due to scientific discoveries adapted and introduced into the economic system by entrepreneur-innovators who call into question the initial equilibrium. Wasn’t the process of creative destruction (Schumpeter, 1939) behind the successful transition from growth to competitiveness?

2.1.2 From the concept of a growth pole to the notion of a competitiveness pole

A growth pole usually develops around a natural resource base. The location of the production units that drive it gives the area the character of a polarized, agglomerated economy par excellence. The ability of these driving forces to influence and interact with their environment boosts the region’s development. The result is a polarized industrial economy with complementary or integrated business networks. An industrial, commercial,

and business environment emerges, with all the complicities that characterize it. “Industry develops through a continuous production process in which each machine on a production line, depending on its characteristics, requires gestures that are cataloged, timed, and chained together. And it is the rigorous organization of production, supply, and management that determines product quality and company profitability” (Delalande, 1987: 25-26). The resulting disproportionate growth spreads through various channels and with varying end effects for the economy as a whole. The growth pole thus creates “basic and non-basic jobs” (Gérardin and Poirot, 2010: 29) and distributes income.

This unbalanced growth model has enabled the countries of advanced capitalism to enjoy fantastic economic development, of which the “thirty glorious years” (Fourastié, 1979: 1) associated with Fordism are a typical example. The limits of the Perrouxian pole of growth, however, lie in the development of new information and communication technologies, which since the early 1980s have imposed a new style of development compatible with the demands of increasingly globalized economies. This raises the crucial question of the transition from “the catch-up economy to the innovation economy” (Blanc, 2004). Porter (1990) drew on the Ricardian theory of comparative advantage to propose the notion of competitive clusters. The principles underpinning these clusters derive, in part, from comparative cost theory, which shows how a territory gains from trade by specializing in the activity where it has a relative advantage, i.e. in the production of the good where it is relatively better or least bad. In an economically weak country like Niger, mining resources, if well channeled and judiciously used, can enable the country's economy to take off, and even create competitive clusters within the territory or in other territories of the same country. But Niger, with its wealth of mineral resources exploited by multinationals for many years, is caught in the trap of impoverishing growth.

The transition from the growth pole to the competitiveness pole has taken place mainly through the Schumpeterian concept of creative destruction. Manifestations of growth are reduced to the postulate of innovation, which we know to mean “both threat and opportunity” (Larue, 1991: 25). Thus, the impulses essential to all cycles of the Juglar (1862), Kondratieff (1920) and Kitchin (1923) type, arising from new combinations, lead to major innovations. These disrupt the initial neo-classical equilibria, threatening what has already been achieved and opening up prospects for improving production and exchange structures based on new opportunities. This Schumpeterian dynamic induces breaks in the system's growth rates. The knowledge-based economy emphasizes innovation as the main factor in the rational production, exploitation, and use of knowledge. Following on from endogenous growth theories (Romer, 1986), innovation is now recognized as one of the key elements of growth. It injects a new dynamic into the polarized territory, which then becomes “the locus of innovations with spin-off perimeters and dynamics” (Guilly and Torre, 2000), where the growth cluster is driven by the forces of attractiveness and competitiveness.

A competitiveness pole is a delimited geographical area where a post-industrial, territorialized economy is developing, with a high raw materials content and a focus on knowledge, know-how, innovation, information, education, creativity, and ingenuity. Cross-disciplinarity is at the heart of this model: research laboratories, training, and business are closely interwoven. This new key to growth, embodied by the innovation economy, implies a networked organization of the territory. This model, which facilitates the circulation of information and creates the essential synergies and cooperation between the cluster's leaders, is a source of added value, and therefore of growth. The most prosperous regions in Europe, the United States, and emerging countries are those that have succeeded in establishing strong synergies between research, higher education, innovation systems, and, of course, the business world. A cluster is both an enrichment and an extension of the Perrouxian growth

pole. However, the two concepts are not in opposition but rather complement each other, the former integrating and framing the latter in a dissymmetrical relationship of influence.

However, the conditions for creating a structured competitiveness cluster around uranium activities are far from being met in Niger. Indeed, there are as yet no production units focusing their activities on cutting-edge technologies aimed at markets with high growth potential. The absence of a dense network of relationships between companies means that there is no critical mass of skilled managers capable of creating the conditions for acquiring and developing international visibility. As a result, it is not immediately possible to create a viable interface between the corporate production sector and university research and training institutions. These shortcomings are not insurmountable in the long term.

Before examining the conditions for the creation, operation, and animation of a growth pole, or even a cluster, within an economically under-equipped country like Niger, it is important to highlight the place of the uranium mining industry in the economy.

2.2 The role of the uranium industry in Niger's economy: from the uranium boom to the present day

Agriculture and livestock farming are the mainstays of Niger's economy, although “the country is rich in mineral and energy resources, most of which are poorly understood and little or not exploited” (Atlas National du Niger, 2002). Mining played a marginal role in the country's economy until the late 1960s. The resource exploited, cassiterite, contributed less than 1% to gross domestic product (GDP). The development of uranium ore at Arlit and Akokan in the early 1970s changed the sectoral proportions of the Niger economy. Uranium now plays a central role in export earnings and can contribute to building a dynamic economic fabric in the country.

2.2.1 The uranium industry's contribution to the Niger economy

Through its weight in export earnings, the uranium industry has influenced the trajectory of the national economy, exerting relative domination over whole swathes of the country's socio-economic sectors. In fact, during the 1977-1981 period, direct state intervention focused mainly on the mining and energy sectors, buildings and public works, and the social sectors. The result was the development of a modern public and semi-public sector.

However, despite the country's potential of becoming a pole of growth and competitiveness at the regional level, Niger faced many challenges like harsh climatic conditions and economic vulnerabilities, accentuated by drought and declining agricultural revenues.

The “uranium boom” period from 1975 to 1983 saw a surge in public investments financed by uranium export revenues, boosting GDP growth to 7.5% annually. Naudet (1993) argues that this investment dynamic enhanced trade balance and state budgetary resources, with a focus on social and educational sectors, alongside productive sectors like infrastructure development.

Despite the significant contribution of the uranium industry to export earnings and tax revenues (up to 40% of tax revenues and over 75% of total export value on average per year from 2006 to 2020 (see figure 2)), its real GDP share remained relatively low due to high intermediate consumption costs (INS, 2007, 2022). For instance, Figure 1 shows that the share of intermediate consumption rose from 15.4 billion CFA francs in 1976 to its record level of 62.5 billion CFA francs in 1980. The industry's contribution exhibited fluctuations, with a peak in the 1980s followed by a downward trend in the later years, reflecting market crises and price variations. However, bilateral negotiations on uranium prices made by the

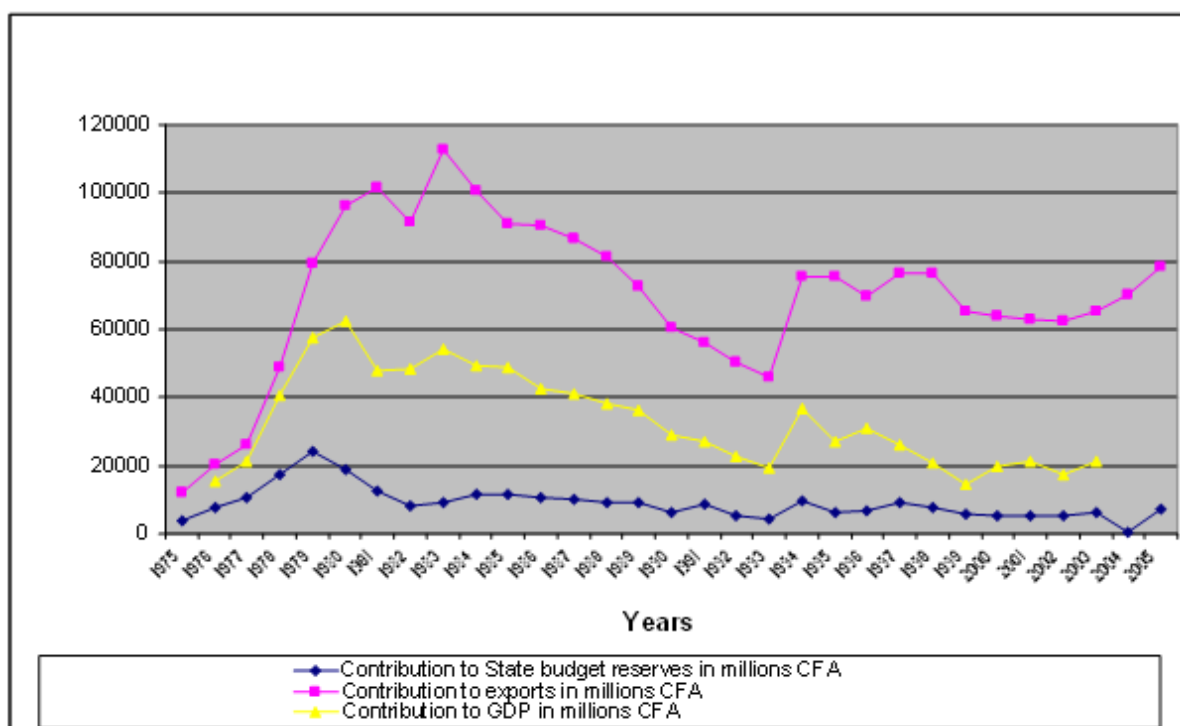
country with AREVA (now ORANO) company in August 2007 led to an increase in the uranium price to 40,000 CFA francs which has significantly improved the country's export revenues.

Uranium's role in Niger's economy extended to tax revenues, with fluctuations in its contribution to public revenue flows. While uranium historically dominated Niger's export profile, diversification efforts, including increased oil exports, have altered this landscape. The industry played a vital role in trade balance improvements and international debt capacity during its peak periods (BCEAO, 2006, 2010). Figure 1 shows the evolution of uranium export revenues in billion CFA francs.

Challenges arose post-1980s due to declining uranium prices, impacting export volumes and government revenue reliance. Figure 1 presents in detail how uranium's share of government revenue declined over time. Despite subsequent export growth since 2003, productivity losses at extraction sites posed obstacles. Negotiations on uranium prices, primarily based on long-term contracts, influenced revenue fluctuations. The evolution of uranium's contribution to the national economy in percentage is presented in Figure 2.

The uranium sector's prominence in Niger's exports underscores the country's vulnerability to market fluctuations. While uranium revenues initially fueled public spending and infrastructure development, concerns arose regarding the sector's long-term sustainability and the equitable distribution of benefits. Studies highlighted disparities in uranium extraction revenues between Niger and international mining companies, raising questions about resource management and revenue-sharing practices.

Figure 1: Contribution of uranium to the national economy by value (millions CFA)



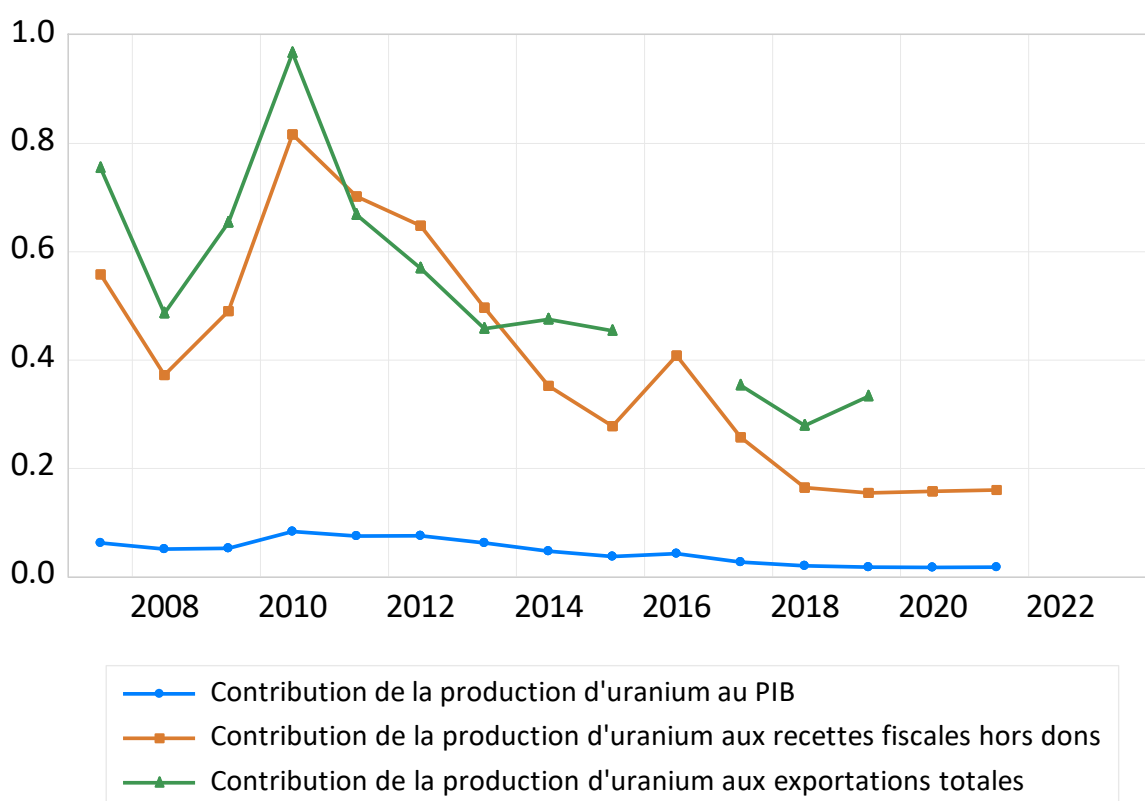
Source: National Institute of Statistics and Ministry of Mines and Energy of the Republic of Niger.

Since 1970, the uranium industry has become a veritable modern labor pool. The two mining companies have given rise to “induced towns (Arlit-Akokan agglomeration) with 68835 inhabitants, i.e. over 70% of the department's population” (RGP/H, 2001). A vocational training school, Ecole des Mines de l’Air (EMAIR), is located in Agadez. Uranium

companies remain the second largest employer in the modern sector after the state, with an average workforce of over 3,500 employees per year. This situation has changed following the closure of COMINAK in 2021 after fifty years of operation, which has put many employees out of work. Similarly, informal jobs linked to the positive externalities arising from uranium revenues are disappearing or shrinking.

Worse still, the exploitation of mining resources naturally gives rise to negative externalities such as radioactivity, chemical toxicity, water pollution, and many other perverse effects with medium- and long-term consequences for the population and its physical and social environment. Moreover, there is an informational asymmetry between “Principal (State)-Agent (ORANO)” insofar as State ownership is separate from the mining company's control of the exploitation process. The government may seek, through a system of taxation, strong economic incentives to capture the rent resulting from the right to exploit.

Figure 2: Uranium's contribution to the national economy (in percentage)



Source: NIS (Statistical yearbooks) and BCEAO (Online database)

However, it is not sufficiently equipped, since it does not have the necessary information on the capital committed by the mining company, on the risk it takes, and does not know the true production costs. To find a solution to this asymmetry of information, the State can only turn to the establishment of a royalty system in which taxation is set not on profits but on quantities extracted. However, setting the level of royalties may also be associated with an information problem, insofar as the mining company, ORANO, alone has the best information on the actual cost of extraction.

Between 2002 and 2008, the rise in the price of mineral raw materials, a consequence of Asian growth, offered a financial windfall to countries such as Chad and Angola. This explains their strong growth rates since the beginning of the decade. The question remains, however, as to whether this global trend is set to last, as rising prices may lead to the choice

of less raw-material-intensive technologies, such as nuclear generators using enriched uranium.

Proven reserves for the SOMAÏR and COMINAK deposits, together with those at Madaouela, Tiguidda, and Imouraren, are estimated at 27,4491 tonnes (Niger Ministry of Mines and Energy, 2008). World production of natural uranium stood at 53498 tonnes in 2018; Niger (4.7%), the world's seventh-largest producer (far behind Kazakhstan (43%), Canada (15%), Namibia (11%) and Australia (8%)), is one of the European Union's regular suppliers. The EU imports 25% of all its imports from Niger (Euratom, 2023). Niger, France's second-largest supplier, has been contributing 20% of EDF's demand for an average of 8,000 tonnes of uranium a year to power France's nuclear power plants for over five decades.

The place occupied by the uranium industry in Niger's economy demonstrates the dynamic nature of the sector, as it generates growth, has a knock-on effect on the rest of the national economy, and is a source of socio-political tensions and opportunities for the country's future development, despite its introverted yet extroverted nature. The question is, to what extent is the crisis in the uranium sector affecting the capacity for action of Niger's public authorities?

2.2.2 The uranium crisis and its impact on public policy options

In the late 1980s, Niger's economy experienced a downturn due to the uranium crisis, impacting its growth trajectory. The uranium sector, previously a key driver of economic growth, now become a factor in slowing economic activity. The fluctuating dynamics of uranium prices, influenced by factors like falling oil prices and environmental movements, led to a price crisis. This crisis, combined with reduced production, resulted in a sharp decline in uranium demand from Southern countries (Antchan et al., 1990:312). The decrease in uranium prices, coupled with rising import costs, worsened Niger's terms of trade, leading to a decline in budget revenues and a widening public finance deficit. The country's heavy reliance on uranium for tax revenues made it vulnerable to market fluctuations and highly indebted (Direction des Mines, 1996).

The limited diversification of the country's export product mix and the very short period (1975-1983) of the uranium boom prevented the development of export sectors to serve as a relay for this exhaustible mining resource. Indeed, fewer than five primary products account for over 90% of exports. Until 1974, the main exports were groundnuts, live cattle, and hides and skins. From that date onwards, uranium led to a significant reduction in agricultural products and increased concentration. Indeed, according to our calculations, the values of the standardized Hirschmann index of concentration of Niger exports rose from 0.569 in 1970 to 0.788 in 1981. This quasi-mono-export situation, which exposed Niger to the harmful effects of the well-known Dutch disease phenomenon, has tended towards diversification since oil came on stream. In fact, the increase in export revenues resulting from the substantial rise in uranium ore prices has led to a swelling of budget revenues, which are now dependent on fluctuations in rents. This situation contributed to economic imbalance and had a negative impact on the economic structure.

The export sector, considered to be the most dynamic, which polarized the factors of production because of the opportunities for wages and profits, has atrophied and shrunk to nothing since 1984. Niger's uncontrollable fluctuations in export earnings are linked, among other things, to the instability of uranium prices on the international market. This, in turn, has reduced the Nigerien government's ability to plan the long-term capital expenditure that is so essential. These erratic movements in revenue have created a raking effect, as expenditure incurred during the uranium boom - in this case, labor recruitment - has been difficult to curb

during the downturn. On the other hand, the non-tradable goods sector, which had been left behind, expanded remarkably.

In short, the sluggishness of the production sector for internationally tradable goods contributed to a significant reduction in the foreign currency inflows so badly needed by the national economy, further widening the country's external imbalance. The combination of these effects has resulted in a dysfunctional economy, which has made uranium manna a blocking factor in Niger's economic and social development process.

Given this situation, the creation of a Perrouxian growth pole that could evolve into a cluster can be examined in light of the lessons learned from forty years of experience in uranium ore mining.

2.3 Prospects for creating a development hub around the Imouraren sites

2.3.1 The challenges facing the uranium industry

Uranium is a strategic resource for the production of atomic weapons and electrical energy, hence its place in a world characterized by a growing unsatisfied need for electricity due to strong demand from emerging countries and accelerating consumption in Western countries as a result of renewed activity in certain sectors (construction, public works, and transport). This explains the creation of new nuclear power plants. However, all projections have shown that the price of a barrel of oil will never return to its 1980s level (i.e. \$20 to \$25 a barrel), and non-polluting nuclear energy is sought after by many countries. What's more, mastery of nuclear technology constitutes a desire for power that imposes a strict hierarchy between nuclear-armed and non-armed states. Added to this is the search for secure supplies and super-profits linked to the cash economy, as well as the desire for conquest and imperialism on the part of multinational mining companies.

In this context, the attractiveness of African producer countries to these companies is increasing. The importance of the stakes surrounding relatively rare, potential, or actual uranium resources generates tensions and instabilities at different spatial scales. At the national level, the opaque management of rents by governments fuels conflicts. External interests fan the flames of interminable armed conflicts by providing financial support to stakeholders in economically weak countries. The stakes are inherent in the intensity of global demand for uranium.

In a report published in 2020 jointly by the OECD's Nuclear Energy Agency (NEA) and the International Atomic Energy Agency (IAEA), it emerged that, despite the increase in global uranium resources, they remain insufficient to cover demand (Uranium 2020 Report online). This excess demand has persisted since 1984, and strategic stocks are insufficient to absorb it. Indeed, demand is set to grow by 1 to 2% over the next few years, against a backdrop of major mine closures rather than openings.

Given its uranium potential, Niger can aspire to be one of the rare suppliers of nuclear energy fuel in the future, while mitigating the risks of social or armed conflict. Uranium resources should not only enable us to harness new nuclear technologies for peaceful purposes but above all serve as a lever for Niger's industrial take-off. The long-term presence of yellow ore extraction units on various sites is sufficient reason to justify the creation of a state-supported growth cluster. However, the conditions for the creation of this pole, located in an underdeveloped desert territory, merit careful analysis.

2.3.2 The conditions for creating a growth pole

The trial of multinational corporations by Western and African intellectuals has certainly helped to discredit foreign direct investment (FDI) as alienating. But despite these criticisms, we must face the fact that technological and financial constraints sometimes force public authorities to practice *realpolitik*. The privatization process that has been underway in Niger since the beginning of the 1980s can, if accompanied by a healthy macroeconomic environment and socio-political stability, help to create a climate conducive to attracting FDI. FDI can contribute to economic development by improving local productivity and competitiveness. FDI should therefore be seen as a means of transferring knowledge, technology, and managerial and commercial know-how.

The establishment of foreign mining companies is an FDI that brings innovation. This investment can lead to other forms of capital formation, making them possible or practically necessary in this desert zone. The installation of uranium extraction plants involves localized, interconnecting physical infrastructure and land-use planning, together with the creation of induced towns with all the complications characteristic of a dynamic environment. It is capable of generating a territorial agglomeration likely to be served by small and medium-sized industrial and commercial enterprises or by public services. This territory, linked to others in the country, the West African region, and the countries bordering the North and the rest of the world, can be a powerful tool for stimulating exchanges and hence territorial development.

The success of this strategy, which involves cultivating capitalist values based on a system underpinned by a set of ethical standards (Sen, 2003), can offer Niger the opportunity to make the most of its mining resources through a strategy of polarized development. In the age of globalization, we must eventually move towards the creation of a Niger cluster.

2.3.3 Conditions for the emergence of a competitive cluster in Niger

Dambron (2008) identifies four key factors in the success of a competitive cluster in France:

- the implementation of a common economic development strategy consistent with the overall strategy of the region;
- in-depth partnerships between players around innovative projects;
- concentration on technologies aimed at markets with high growth potential;
- sufficient critical mass to acquire and develop international visibility.

The first two criteria for the success of a competitiveness cluster are appropriate for Niger, an embryonic industrial country. The other two conditions can only be met over a long period, once the growth cluster has reached cruising speed. If they can feed themselves, Niger's working population will be the market for local businesses, and if they are qualified, they will be the driving force behind industrialization.

The desert areas of the north offer irrigation potential that needs to be developed on a large scale as part of the industrial strategy. This development of existing potential could result in a massive transfer of young workers to these sparsely populated regions. The development of such a potential market is an asset for the planned success of the competitiveness cluster.

The Air region has suffered from the perverse effects of twin deficits that have exacerbated macroeconomic and sectoral imbalances, deficits that have been amplified by uranium rents. This has contributed to compromising the Air's chances of polarized development. This phenomenon is the result of successive economic policies, as the region has not benefited from special financial support in terms of allocating a substantial share of the uraniferous resources injected into the area outside the mining sector; hence the deficit

observed in the formation of dynamic agglomerations around uraniumiferous sites. The result has been a low level of external economic creation, resulting from the combination of centripetal and centrifugal forces leading to the clustering and dispersal of economic activities in the localized area.

The region's limited endowment of non-transportable goods (infrastructure, housing, etc.) has helped to limit the spatial concentration of transportable activities. Other factors explain the current situation in the Air region. These include the weak human capital and financial capacities of public institutions in charge of the mining sector; the inability of successive governments to significantly diversify their partners; the lack of development of existing potential and a policy aimed at settling the population and attracting young workers to occupy territorialized space; the lack of adequate mechanisms to create the conditions for making towns sustainable and transforming them into growth poles; the absence of an observatory to control and monitor the sale of uranium and the management of an equitable share of the rent; the absence of an active civil society capable of drawing attention to mining issues in terms of rent management and the negative externalities associated with uranium mining; the absence of a common West African mining policy.

Ultimately, we need to define a strategic roadmap in conjunction with universities, research centers, and the business community, to make the growth pole and then the cluster in the Air zone operational.

3 Conclusion

Since the 1970s, uranium has played a key role in Niger's socio-economic development process, even if success has often been elusive. As a major contributor to export earnings, it has influenced the trajectory of the economy through its pace of development, placing the country in a situation of increased dependence on an uncertain world market. This unpredictability makes uranium both an opportunity and a source of instability, as the mineral is a source of growth, a spillover effect on the national economy, and a generator of political crises. This source of fissile energy has made it difficult to plan long-term capital expenditure and to anticipate the future. The economy entered an unprecedented recession from the mid-1980s onwards and has yet to rise from the ashes.

To exploit the Imouraren deposits, the State of Niger, in agreement with the mining companies and with the good offices of West African organizations such as the AES and neighboring countries to the north, must create the conditions for the emergence of a growth pole. This industrialization strategy aims to bring about structural changes based on the transformation of natural resources and the emergence of a genuine employment pool. Its success will have a ripple effect across the entire economy, with the creation of dynamic hotbeds of industrialization to gradually reduce poverty and the frequency of food and socio-political crises. It is at this price that the State of Niger could transform its subsoil resources into assets for long-term industrial development. However, this policy needs to be accompanied by a detailed roadmap focusing on the interface between research centers, training institutions, and the business world. All stakeholders must be involved, under the watchful eye of Niger's civil society, the Extractive Industries Transparency Initiative, and the international community, to ensure that the negative externalities arising from uranium mining are properly monitored, controlled and, where appropriate, any victims compensated by the mining companies.

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