

Analyzing the Role of Industrial Clusters in Enhancing Competitiveness According to Porter's Model: A Case Study of the Soft Drinks Cluster in Tadjenanet – Mila Province

SENOUSSI OUSSAMA¹ / Institute of Economics, Business and Management Sciences,
Centre Universitaire Abdelhafid Youssouf, Mila, o.senoussi@centre-univ-mila.dz

ARAMA RIAD / Laboratory for Studies on Economic Diversification Strategies for Achieving Sustainable Development, Centre Universitaire Abdelhafid Youssouf, Mila, Algeria,
arama.riad@centre-univ-mila.dz

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Abstract:

Industrial clusters are key to revitalizing industrial enterprises by enhancing their competitiveness in dynamic environments. Unlike isolated firms, clusters reduce fragmentation and foster integration, enabling better use of advanced technology and skilled labor. This leads to improved production quality, higher productivity, expanded market share, and increased profitability. Additionally, clusters contribute significantly to national economic growth. The non-alcoholic carbonated beverage cluster in the Tadjenanet area plays a significant role in supporting the local economy. It has effectively contributed to increasing the production efficiency of enterprises, creating growing job opportunities, and developing a skilled workforce in modern fields and technologies. This cluster has also helped meet the local market's needs in terms of quantity and variety, which has strengthened the competitiveness of enterprises and contributed to achieving sustainable economic growth at both the local and national levels.

Keywords: Industrial Clusters; Competitiveness.

Jel Classification Codes: L25; O14.

Résumé:

Les clusters industriels jouent un rôle crucial dans la revitalisation des entreprises industrielles en renforçant leur compétitivité dans des environnements dynamiques. Contrairement aux entreprises isolées, les clusters réduisent la fragmentation et favorisent l'intégration, ce qui permet une meilleure utilisation des technologies avancées et de la main-d'œuvre qualifiée. Cela se traduit par une amélioration de la qualité de production, une productivité accrue, une expansion de la part de marché et une rentabilité renforcée. Par ailleurs, les clusters contribuent de manière significative à la croissance économique nationale. Le cluster des boissons gazeuses non alcoolisées dans la région de Tadjenanet illustre bien cet impact. Il a permis d'améliorer efficacement l'efficacité de production des entreprises, de créer de plus en plus d'opportunités d'emploi, et de développer une main-d'œuvre qualifiée dans des domaines et technologies modernes. Ce cluster a également contribué à satisfaire les besoins du marché local en termes de quantité et de variété, ce qui a renforcé la compétitivité des entreprises et participé à la réalisation d'une croissance économique durable tant au niveau local que national.

Mots clés: Clusters industriels ; Compétitivité.

Jel Classification Codes : L25 ; O14.

¹. Corresponding author: SENOUSSI OUSSAMA, e-mail address: o.senoussi@centre-univ-mila.dz

I. Introduction

Small and medium-sized enterprises (SMEs) constitute the cornerstone of economic development in most developing countries, where poverty and unemployment rates are high (Okyere, 2017). Algeria is among the countries that have accorded significant attention to the development of SMEs, owing to their pivotal role in production, employment generation, income enhancement, technological progress, and innovation, in addition to their contribution to achieving broader socio-economic objectives. According to the Ministry of Industry, the total number of SMEs in Algeria exceeded 1,320,664 by the end of June 2022, providing employment for more than 3,220,661 workers (Algerian Press Agency, 2023).

One of the principal strategies adopted by many countries, particularly developing ones, to foster enterprise growth and strengthen competitiveness is the industrial cluster strategy. Over the past years, industrial cluster programs have expanded significantly worldwide in response to increasing international competition. Notably, 26 out of 31 European Union countries have implemented industrial cluster programs. Recently, the European Union issued the European Cluster Memorandum to promote innovation as a means of developing and advancing industrial clusters (Nagy, Elgharbawy, Abdelwahed Abdelbary, & Eshra, 2023, p. 194). Among the key advantages for firms participating in a cluster are the ability to operate within a framework that allows them to benefit from economies of scale, utilize advanced technologies, reduce overall production costs, and improve product quality.

The beverage industry in Algeria plays a significant role in the national economy and local development. The National Office of Statistics reports approximately 300 brands, mostly domestic, with intense competition, particularly during Ramadan and the summer season. Annual turnover in this sector reaches nearly 260 billion Algerian Dinars.

I.1 Research Problem

Despite the presence of several soft drink enterprises throughout Algeria, a notable geographic concentration has emerged in the Tadjenanet Industrial Zone in Mila Province. This concentration raises theoretical and empirical questions about whether it represents a genuine industrial cluster, capable of generating collective competitive advantages, as conceptualized by Porter.

The core problem is determining the extent to which this agglomeration functions as an integrated cluster rather than a simple geographical grouping of firms and whether this structure effectively enhances firms' competitiveness through shared resources, supporting industries, and internal dynamics of cooperation and rivalry. From this perspective, the central research question can be formulated as follows: **How does the concentration of soft drink**

enterprises in Tadjenanet operate as a fully developed industrial cluster, and how does this structure contribute to strengthening firms' competitiveness, based on Porter's model of competitive advantage?

1.2 Sub-questions:

To more precisely address the main research question and explore the different dimensions of the industrial cluster under study, the following sub-questions have been formulated:

- Q1: To what extent does the geographic concentration of soft drink enterprises in Tadjenanet reflect the presence and availability of supporting industries?
- Q2: Does membership in the Tadjenanet soft drink cluster reduce production and transportation costs for enterprises?
- Q3: Do firms operating within the Tadjenanet cluster achieve higher production efficiency than firms outside the cluster?
- Q4: How do supporting industries within the cluster enhance product quality and expand the market reach of member firms?

1.3 Research Hypotheses:

The present study proposes the following hypotheses, the validation (or invalidation) of which is the objective of this investigation:

- The geographic concentration of soft drink enterprises in Tadjenanet is positively associated with the availability of supporting industries, including but not limited to packaging, raw materials, and transport.
- Membership in the Tadjenanet cluster reduces production and transportation costs for soft drink enterprises.
- Firms operating within the Tadjenanet cluster exhibit higher production efficiency than firms operating outside the cluster.
- The presence of supporting industries within the cluster enhances firms' competitiveness in terms of product quality and market expansion.

1.4 Research Significance:

- The role that industrial clusters can play in building an integrated industrial fabric.
- The government's interest in industrial zones and its efforts to enhance the competitiveness of enterprises through the promotion of industrial cluster formation.
- The orientation of the state, under the framework of the "New Algeria," toward strengthening the industrial sector's role in wealth creation and the diversification of the national economy.

1.5 Research Objectives:

- To identify the advantages that firms within an industrial cluster can benefit from.

- To explore the dimensions of competitiveness and their role in enhancing firms' competitive performance.
- To highlight the importance of industrial clusters as one of the key determinants of industrial competitiveness.

I-6. Study Delimitations:

- Spatial Delimitation: The spatial scope of the study was limited to non-alcoholic beverage production enterprises located in the Tadjenanet Industrial Zone, Mila Province.
- Temporal Delimitation: The data and statistics related to the industrial beverage enterprises in the Tadjenanet Industrial Zone, Mila Province, were collected up to the 2023.

I-7. Research methodology:

The study adopted a descriptive approach for the theoretical component, while the analytical approach was employed for the practical component in an attempt to apply the theoretical framework to real-world settings. A case study methodology was utilized, focusing on non-alcoholic beverage manufacturing enterprises forming an industrial cluster in the municipality of Tadjenanet, Mila Province. The data were collected from the study population using interviews, observations, and statistics collected from company officials.

II. Theoretical Framework of Industrial Clusters

The concept of industrial clusters emerged as a fundamental approach to address the challenges faced by industrial enterprises and to achieve improved competitive performance in light of new economic transformations.

II.1 Definition of Industrial Clusters

Professor Michael Porter was the first to provide a clear definition of industrial clusters in 1990 in his book "The Competitive Advantage of Nations". He defined industrial clusters as an economic phenomenon that reflects the competitive environment among a group of firms, where these companies simultaneously compete and cooperate in order to achieve various economic advantages (Catalin, 2011, p. 34).

On the other hand, Doeringer and Terkla approached industrial clusters from a geographical perspective. They defined them as "a geographic concentration of industries that generates benefits through a shared location." (AlTayibi, 2016, p. 84).

H. Schmitz defined industrial clusters as "a geographical concentration of a group of interconnected and related firms operating within a specific field, engaged in both vertical and horizontal integration throughout all stages of the production process. This integration forms a complete value-added chain, encompassing the exchange of goods, services, information, expertise, and human resources." (Shirine, 2019, p. 135).

Industrial clusters are also defined as agglomerations of firms and institutions located within specific geographical areas, whether local, regional, or even cross-border. These clusters consist of interconnected companies that engage in mutual and continuous interaction within a particular context, forming an integrated system of activities aimed at enhancing and strengthening competitiveness (Chawqi & Alawadi, 2012, p. 37).

II.2 Advantages of Industrial Clusters

Industrial clusters offer several advantages, including (Aboud & Twaitia, 2014, p. 164):

- Reduction in transaction costs during the production phase, which leads to lower production costs and, consequently, enhances the competitive advantage of products.
- Concentration of technical expertise, both human and technological, in closely related and complementary fields. This concentration allows small units to benefit from economies of scale by specializing in a specific phase or component of the final product. It also enables bulk purchasing of raw materials at preferential prices and contributes to the development of essential infrastructure such as legal, financial, and other specialized services.
- Generation of external economies, such as the emergence of marketing agents or specialized suppliers of production inputs.
- Lowering of transaction expenses throughout production stages, which again contributes to reducing production costs and improving product competitiveness.

II.3 Types of Industrial Clusters

Industrial clusters can be classified according to two main criteria: size and degree of interconnection (Ayman, 2022, p. 78).

II.3.1 Industrial Clusters by Size: Based on size, industrial clusters can be classified into small, medium, and large clusters according to a set of criteria such as geographic spread, sales volume, number of firms, number of branches, and the capacity to create employment opportunities, among others. The wider the scope of the industrial cluster and the more institutions and stakeholders involved, the greater its attractiveness and likelihood of achieving success.

- Some clusters are classified among the largest industrial clusters globally; for instance, the number of firms operating within the garment manufacturing clusters in Italy and India exceeds 9,000. Nonetheless, it is generally preferred that a cluster consists, on average, of 100 to 150 firms. For example, the United Nations Industrial Development Organization (UNIDO) specifies that an industrial cluster should have no fewer than 100 firms, with a mix of medium and small enterprises. This composition enables the cluster to withstand challenges

arising from external shocks, such as the exit of a firm from the cluster, changes in skilled labor availability, or the loss of a supplier.

- In a study conducted by the Institute for Strategy and Competitiveness at Harvard University on a sample of 382 industrial clusters, it was found that the average number of firms per cluster is approximately 150. The study classified clusters as follows:

- 42% of clusters include fewer than 100 firms;
- 14% of clusters have between 100 and 200 firms;
- 9% of clusters include up to 300 firms;
- 25% of clusters have more than 600 firms.

II.3.2 Industrial Clusters by Degree of Interconnection: Industrial clusters can be classified based on the type of interconnection into vertical and horizontal clusters. Typically, industrial clusters encompass all stages of the production process, including both industrial firms and supporting institutions, which are interconnected and integrated either vertically or horizontally. (Ayman, 2022, p. 80).

• **Vertically Integrated Clusters:** This type of cluster forms around one or several large companies and is expanded through the participation of a large number of small firms. These small firms contribute by supplying production inputs to the larger companies, thereby creating an integrated operational relationship between buyers and suppliers. For example: the automotive industry cluster.

• **Horizontally Integrated Clusters:** This type consists of a large number of small and medium-sized enterprises (SMEs) that focus on the production and marketing of final products. These firms often share technologies, collaborate in utilizing available resources and labor, and may work together to target new markets for their final goods.

II. 4 Advantages and Characteristics of Industrial Clusters

Industrial clusters possess a set of advantages and characteristics that revolve around boosting growth rates and enhancing the competitiveness of the firms within the cluster. They also contribute to job creation whether low-skilled or highly qualified, permanent or temporary positions, and play a significant role in encouraging innovation. The key advantages and characteristics of industrial clusters can be summarized as follows (Gharbi & Omar, 2021, p. 297):

- Industrial clusters promote innovation, which contributes to business growth and fosters an entrepreneurial spirit by supporting entrepreneurship.
- They focus on supporting industries that provide specialized and specific components of production inputs, playing a key role in advancing the development of core industries and enhancing their global competitiveness.

- Industrial clusters lead to job creation, thereby contributing to the reduction of unemployment rates. In addition, they help attract foreign investment and boost economic growth (Mokhtari, Brahimi, & Rejimi, 2020, p. 32).
- The presence of local suppliers for raw materials intended for production offering highly competitive prices that are lower than those of imported materials enhances the competitiveness of local products at both national and international levels.
- The geographic concentration of industrial clusters varies from one cluster to another; it may occur within a single city, a group of cities, or an entire country. With the significant advancement in transportation, communication, and technology, a cluster can even span across multiple neighboring countries.
- Clusters facilitate the exchange of information and acquisition of knowledge, thereby accelerating the ability to respond to changes within the industry.
- They also ease access to financial resources, as financial markets within the cluster are often familiar (Zuhair, 2014, p. 5).
- They facilitate access to financial resources, thanks to the presence of financial markets that are knowledgeable and well-acquainted with the specific industry.

II. 5 Mechanism of Industrial Clusters Functioning

Industrial clusters operate based on five core principles:

- **Geographic Concentration:** This is the foundational principle of how industrial clusters function. Firms gather in a specific location due to tangible advantages such as natural resources, infrastructure, or proximity to skilled labor, financial services, suppliers, and advanced technologies. Firms are attracted to clusters to reduce costs, benefit from economies of scale, access specialized support, and be closer to markets to increase sales. Clusters also enhance firms' capacity through information exchange, continuous learning, development, and expanded networks.
- **Specialization:** An effective cluster requires strong companies specialized in their respective fields, which complement each other in producing more advanced and distinctive products. The more capable and pioneering these firms are in developing their products, the more successful the cluster becomes. However, this does not mean the cluster should be isolated. Connections with other clusters can contribute to its development and even lead to the emergence of new products or specialized clusters. An example is biotechnology, which resulted from collaboration among clusters specialized in medical sciences, food science, agriculture, and environmental studies.
- **Innovation:** Innovation is a key indicator of a cluster's vitality and competitiveness. When a firm develops a new product, competitors quickly respond by creating rival products, while imitators produce the same item at a lower cost, often with minor improvements. This dynamic compels the original

innovator to further enhance its product or develop new ones, fueling a continuous innovation cycle. This ongoing process strengthens the overall competitiveness of the cluster.

- **Competition:** Competition among firms serves as a driving force for innovation and technological advancement. It leads to the emergence of new specializations and activities, promotes scientific research, and improves workforce efficiency by increasing demand for skilled labor and training programs. However, limited competition can negatively affect a cluster's long-term competitiveness, resulting in fewer firms, reduced employment, and slower technological progress.

- **Cooperation:** This concept complements competition rather than opposing it. The success and growth of competitive firms increase demand for their suppliers' products and services. As clusters expand, stronger relationships develop between companies, creating mutual benefits. Strategic partnerships, joint production, and collaboration generate more value than operating alone by reducing costs, improving quality, and expanding market and customer access.

With more firms and heightened competition, innovation speeds up, aided by advances in information technology. Many companies form alliances to strengthen their cluster position. In fact, any company aiming to enter the industry often needs to be part of the cluster. Such dynamic clusters attract global professionals and experts due to plentiful job opportunities.

III. Theoretical Framework of Competitive Advantage

III.1 Definition of Competitive Advantage

Competitive advantage refers to the factors or characteristics that distinguish a given firm from its competitors. The primary goal of creating a competitive advantage is to enable the firm to secure the largest possible market share, especially in highly competitive environments. This advantage may be achieved through cost reduction, which allows the firm to control pricing relative to its competitors, or through unique product features that increase its perceived value enabling the firm to set a price aligned with its strategic positioning and customer expectations (Chawqi y. , 2018, p. 110).

Porter defines it as the value that an organization is able to create for its customers, which can take the form of offering lower prices for products or services in the market compared to its competitors while maintaining the same benefits and features, or by offering a product with unique benefits that distinguish it from competing products at higher prices, where the added value and quality of the product justify the price increase (qadri & mohammed, 2016, p. 14).

III.2 Competitiveness Measurement Indicators

There are a set of indicators that determine competitiveness, represented by four main indicators (Salem, 2021, pp. 234-235).

- **Market Share:** Market share is considered an indicator that reflects the volume of a firm's sales within the market. Maximizing market share helps establish a solid foundation that enables the firm to continue operating efficiently and sustainably. It is defined as the percentage of total sales of the company's products and services which is calculated by assessing the revenue or profits generated. Based on this, the company directs its production, distribution, and marketing activities and analyzes its market position accordingly.
- **Profitability:** Profitability is regarded as a sufficient indicator of a firm's competitiveness. While market share also serves as a competitiveness metric, a firm can aim to maximize its profits without necessarily sacrificing profitability for a higher market share. Additionally, a company can remain competitive even in a declining competitive market by increasing its market share through price reductions, which may result in lower profitability. In such a case, competitiveness alone does not guarantee profitability. For a firm aiming to sustain its market presence, profitability must be maintained over time, as the present value of a firm's profits is inherently linked to its market value.
- **Costs:** Production cost is considered a reliable indicator of competitiveness, particularly in markets characterized by homogeneous products (perfect competition). Cost reduction strategies specifically reducing production costs are among the most important strategies pursued by firms to create their own competitive advantage. This is achieved by avoiding errors and deviations in the production process and by adopting an efficient, high-quality operational system (Sahnoun & Hamdi, 2010).
- **Productivity:** Productivity is considered one of the key indicators for measuring competitiveness, as it reflects the efficiency with which resources are utilized to achieve the desired output. It represents the relationship between the quantity of resources used in the production process and the final output generated through that process. Accordingly, firms strive to optimize the use of available resources in order to increase productivity, which in turn leads to cost reduction and provides a competitive edge over rivals (Al-Matari, 2018).

III.3 Models of Competitiveness Determinants

There are several models that identify the determinants of competitiveness, including the Brinckman's model, Porter's model, and the Lall model. In this study, we will focus on Porter's model, which is considered the most widely adopted and appropriate approach, as it has been the basis for numerous academic studies.

This model is strongly linked to the concept of competitiveness. Porter's analysis starts at the microeconomic level, that is, the firm, and he argues that neither industries nor nations compete directly in a given sector; rather, a nation's competitiveness is derived from the competitiveness of its firms.

According to Porter, the main determinants of a firm's competitiveness are as follows (Bougrana, Bensaci, & Miloud, 2013, pp. 46-47):

- Factor conditions (as a key determinant of competitiveness);
- Demand conditions (particularly domestic demand)
- Firm strategy, structure, and rivalry, including the nature of local competition;
- Related and supporting industries, and the quality of their presence.

In addition to these core determinants, the role of government and chance events can also influence competitiveness.

IV. Analysis of the Relationship Between Industrial Clusters and Competitiveness

IV.1 The Relationship Between Industrial Clusters and Competitiveness

Industrial clusters are considered one of the key factors in enhancing the competitiveness of small and medium-sized enterprises (SMEs). They enable these enterprises to benefit from economies of scale, reduce production costs, improve product quality, and adopt modern technologies. The geographical concentration of firms within a specific area fosters knowledge exchange, attracts skilled labor, and facilitates access to resources and supporting services. This, in turn, allows firms to respond more efficiently to market challenges. Therefore, industrial clusters play a direct role in strengthening competitiveness at the firm level, regional level, and ultimately, the national economy (Morgan, 2014, p. 46).

IV.2 The Role of Industrial Clusters in Enhancing Competitiveness

• **Division of Labor and Cost Reduction:** Shared facilities and a close location lower production and transaction costs, while common values build trust and ease cooperation.

• **Innovation Boost:** Proximity fosters quick knowledge exchange and healthy competition, driving continuous innovation and new business creation.

• **Long-Term Economies of Scale:** Specialization and collaboration expand markets, reduce costs for materials and transportation, and improve access to skilled labor, helping firms adapt to changing demands and maintain a competitive edge.

V. An Analytical Study of the Soft Drink Industry Cluster in the Tadjenanet Area, Mila Province

V.1 The Emergence of the Soft Drink Industry in the Tadjenanet Area, Mila Province

The text highlights the pioneering role played by SPRING Company in establishing the non-alcoholic soft drink industry in the Tadjenanet industrial zone. The company began with a limited geographical reach and a small workforce. However, by adopting a well-planned strategy amid minimal competition, it succeeded in building a strong brand and capturing a significant share of the local market.

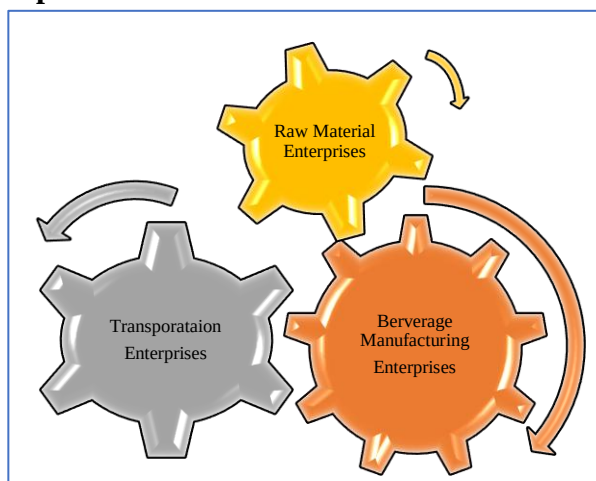
This success led to the expansion of its operations in terms of infrastructure, human resources, and distribution network, which in turn attracted other investors to the sector. As a result, new companies emerged in the same field, forming the foundation of an integrated industrial cluster for soft drink production, supported by complementary enterprises that enhanced the industrial dynamism of the region.

The analysis demonstrates how a pioneering enterprise can play a central role in the emergence of an industrial cluster by spreading knowledge, offering a successful model, and creating an environment conducive to investment and growth.

V.2 Components of the soft drink Industrial Cluster

It can be said that the soft drink industrial cluster in the Tadjenanet area of Mila Province consists of a group of industrial entities, as illustrated in the following figure

Figure (01): Components of the drink Industrial Cluster in the Tadjenanet



Source: Prepared by the authors based on field observations and enterprise documents.

V.2.1 Soft Drink Manufacturing Enterprises: One of the fundamental elements in studying the structure and development of industrial clusters is identifying the constituent enterprises and their historical evolution. The following table illustrates the soft drink manufacturing enterprises in the Tadjenanet area along with their years of establishment.

Table (01): The Establishment of Soft Drink Manufacturing Enterprises in Tadjenanet, Mila Province

Name of the Enterprise	Year of Establishment
Sari spring	1987
SODA EXCELLENCE BOUGUERRA DJAMEL	2001
SOCIETE EL FARAH	2012
SARL BILARAN	2012
Production Boissons Gazeuse HELLAL KHAYREDDIN	2016
SOCIETE BOUGUERRA ABDELHAK	2018

Source: Prepared by the authors based on official enterprises records

The data in Table (01) indicates that the soft drink sector in Tadjenanet has experienced continuous growth in terms of the number of enterprises established in the area. The variation in founding years also reflects the sector's expansion, which can be attributed to increasing local demand and the attraction of entrepreneurial initiatives in the region.

V.2.2 Supporting Enterprises for Soft Drink Manufacturing Firms:

Supporting enterprises are considered a fundamental element in enhancing the competitiveness of the industrial cluster and in increasing its operational efficiency. These enterprises provide various production inputs. The following table presents the supporting enterprises and the products they supply to the soft drink industry cluster in the Tadjenanet area.

Table (02): Supporting Enterprises of the Industrial Cluster and Their Product Types

Name of the Enterprise	Type of Product Provided	Address
SARL SAGIO FORM	Liter Bottle or Bottles with a Capacity of (0.33 L – 1 L – 1.25 L – 1.5 L – 2 L)	National Road No. 05, Tadjenanet
SARL RESTOR PRINT	Labeling (Final Product Identification Tag)	Tadjenanet Industrial Zone
ETS GUENDOUZI AHMED	Emulsifiers and Flavorings (Aspartame, Acesulfame, Citric Acid, Coloring, etc.)	Tadjenanet Activity Zone
SARL GDZ	Emulsifiers and Flavorings (Aspartame, Acesulfame, Citric Acid, Coloring, etc.) (duplicate)	Tadjenanet Activity Zone
EURL BOUGUERRA	Labeling (Final Product Identification Tag) (duplicate)	El Houari Boumediene District, Tadjenanet

Source: Prepared by the authors based on official enterprises records

The data in Table (02) shows that each supporting enterprise provides essential products for the soft drink manufacturing process, ranging from flavoring agents and emulsifiers to packaging and bottling materials. The table also clearly illustrates the geographic distribution of these enterprises within the Tadjenanet area, which ensures a smooth supply chain. This proximity among supporting enterprises offers several advantages, including reduced transportation costs, accelerated production processes, and enhanced collaboration between supporting and manufacturing firms within the Tadjenanet soft drink industry cluster

5.2.3 Freight Transport Enterprises: The following are the main freight transport companies that support the soft drink industry cluster in Tadjenanet:

- Koumedi Abdelghani Freight Transport Enterprise
- Joudi Transport Company (Semi-trailer trucks – heavy-weight category)
- Bouzeid Brothers Freight Transport Enterprise

- Belkheir Freight Transport Company
- SARL Frères Bouguerra – Road Transport Company (Frères Bouguerra Road Transport)
- Regai Issmail Freight Transport Enterprise

V.3 Production Factors:

The production factors underpinning the soft drink industry cluster in Tadjenamet can be illustrated as follows:

V.3.1 Human Resources: The analysis highlights that recruitment across enterprises in the Tadjenamet soft drink cluster is largely centralized through the local employment agency, which acts as a key intermediary between job seekers and companies. Field interviews confirm that all cluster firms rely on this agency to hire workers suited to their production needs, particularly for roles such as machine operators and material handlers.

This system ensures access to a labor pool with relevant experience, enhancing recruitment efficiency and workforce quality. A notable proportion of positions, especially those requiring dexterity and attention to detail, are occupied by female workers. Recruitment decisions are often based on prior experience, which boosts productivity and reduces costs. Additionally, enterprises are investing in workforce training, including safety certifications and vocational qualifications in technical fields like electricity and industrial programming. Companies such as SPRING also aim to obtain HACCP certification, reflecting a broader commitment to quality standards and continuous improvement.

Overall, the availability of a skilled and specialized workforce, coupled with targeted training programs, strengthens the cluster's competitive advantage and capacity for innovation.

Table (03): Evolution of the number of workers within the soft drink industry cluster

Name of the Enterprise/ Years	2018	2019	2020	2021	2022	2023
SARL SPRING	18	19	22	15	23	25
SODA EXCELLENCE BOUGUERRA DJAMEL	15	17	18	22	25	29
SOCIETE EL FARAH	14	15	15	15	20	22
SARL BILARAN	20	20	19	20	22	23
Production Boissons Gazeuse HELLAL KHAYREDDIN	5	6	6	7	7	9
SOCIETE BOUGUERRA ABDELHAK	13	15	16	19	20	25
Total	62	73	74	83	94	133

Source: Prepared by the authors based on field interviews and internal workforce records of enterprises

It is observed from the table that all enterprises are experiencing increasing employment levels, indicating a continuous effort to expand their workforce. The total number of direct employees within the industrial cluster reached 133 workers in the 2023.

V.3.2 Technological and Technical Development: The various types of equipment integrated within the soft drink industrial cluster can be illustrated in the following table.

Table (04): Machinery and Equipment Owned by Enterprises within the Industrial Cluster

Name of the Enterprise	Manufacturing Tools and Equipment	Date of Acquisition
SARL SPRING	Bottle Blowing Machine	2009
	Air Conveyor	
	Filling Machine	
	Mechanical Conveyor Belt	
	Labeling Machine	
	Date Printing Machine – Packaging Machine	
	Palletizing Robot	
	Wrapping and Packaging Machine	
SODA EXCELLENCE BOUGUERRA DJAMEL	Bottle Blowing Machine	2016
	Product Packaging Machine	
	Mixing Machine	
	Labeling Machine	
SOCIETE EL FARAH	Filling Machine 1	2012
	Product Packaging Machine	2012
	Filling Machine 2	2014
	Bottle Blowing Machine	2014
SARL BILARAN	Mixing Machine	2012
	Product Packaging Machine	2012
	Labeling Machine	2014
	New Production Line No. 01	2014
	New Production Line No. 02	2016
Production Boissons Gazeuse HELLAL KHAYREDDIN	Filling Machine	2016
	Wrapping Machine	2016
	Labeling Machine	2017
SOCIETE BOUGUERRA ABDELHAK	Bottle Blowing Machine	2018
	Wrapping Machine	2018
	Mixing Machine	2018
	Labeling Machine	2018

Source: Prepared by the authors based on technical documentation and machinery acquisition reports from enterprises

The analysis shows that companies within the Tadjenanet soft drink cluster have actively modernized their production processes. Spring Company shifted in 2009 to plastic bottle production, aligning with market needs and reducing costs.

SARL BILRAN expanded in 2014 with advanced production lines, while H. Khayr Eddine and Bouguerra Abdallah entered the market with new equipment in 2016 and 2018. El Farah also upgraded its machinery in 2014. These efforts reflect a collective move toward technological advancement to improve competitiveness, reduce costs, and meet market demand.

V.3.3 Financial Resources and the Banking Sector: The enterprises within the soft drink industry cluster primarily rely on their internal financial capacity to fund production and expansion activities. However, in the case of large-scale projects with long-term financial needs, these companies may also turn to the banking sector. It is worth noting that the city of Tadjenanet hosts three commercial banks:

- Bank of Agriculture and Rural Development (BADR)
- National Bank of Algeria (BNA)
- National Savings and Reserve Fund (CNEP Bank)

V.3.4 Raw Materials: The growth of the soft drink industry cluster in Tadjenanet has attracted several raw material supplying enterprises, which are detailed in the following table.

Table (05): Raw Material Supplying Enterprises within the Soft Drink Industry Cluster

Name of the Beneficiary Enterprise	Raw Material	Name of the Supplier	Business Location Address
Sari spring	Citric Acid	EST GUENDOUZI SARL GDZ	Tadjenanet Industrial Zone
SODA EXCELLENCE BOUGUERRA DJAMEL	Sodium Benzoate		
SOCIETE EL FARAH	Aspartame		
	Acesulfame Potassium		
	Flavoring (or Aroma)		
SARL BILARAN	Bottles Labels	SARL SAGIO FORM	Tadjenanet Industrial Zone
Production Boissons Gazeuse HELLAL KHAYREDDIN		SARL RESTOR PRINT	Tadjenanet Industrial Zone
SOCIETE BOUGUERRA ABDELHAK		EURL BOUGEURRA	Tadjenanet Activity Zone

Source: Prepared by the authors based on procurement records and supplier contracts provided by the enterprises.

These enterprises supply raw materials to the soft drink industry cluster, thereby eliminating the need for imports or sourcing from companies located in other provinces. This local supply has facilitated easier and more affordable access to inputs, particularly by reducing transportation costs. As a result, productivity has improved, driven by stable market demand, ultimately generating increased profitability for the cluster's enterprises.

V.3.5. Transportation Costs: Enterprises within the cluster share access to a freight transport fleet established for renting trucks (trailers and semi-trailers) operating across various provinces. The fleet consists of more than 40 trucks, fostering competitive pressure among service providers. This competition has positively impacted transportation costs, resulting in a low-cost advantage that has contributed to increased demand and higher productivity.

V.3.6. Infrastructure: The soft drink industry cluster in Tadjenanet is located within a well-developed industrial zone, making it one of the most important industrial hubs both regionally and nationally. The zone is equipped with infrastructure suitable for industrial activity, including water networks, high-voltage electricity, natural gas pipelines, and strategic geographic access via National Road No. 5, which connects eastern Algeria to the capital, Algiers. Additionally, Tadjenanet has access to the East–West Highway through a dedicated interchange and is connected to the national railway network. These features have significantly facilitated the distribution and marketing of products across neighboring provinces.

V.4 Demand Conditions: Production volume is determined by actual demand, particularly in the case of SPRING Company, which manufactures based on customer orders. The company primarily targets southern regions of Algeria, where most of the cluster's products are sold. Given the seasonal nature of the soft drink industry, summer is the most demanding period due to a spike in consumption across all product sizes.

V.5 Related and Supporting Industries: These include essential raw materials and packaging components required to complete the final product, such as:

- Emulsifiers and flavorings: Aspartame, Acesulfame Potassium, Citric Acid, Coloring agents, etc;
- Labels (for final product identification);
- Bottles of various sizes: 0.33 L, 1 L, 1.25 L, 1.5 L, and 2 L.

V.6 Firm Strategies: Enterprises within the Tadjenanet soft drink cluster aim to maintain their market share in an open, highly competitive environment, including competition from both domestic and foreign firms. Each company adopts its own strategic approach:

- SPRING focuses on producing a single 1-liter product in various flavors, with a particular emphasis on the "bitter" flavor, which is known for its high quality and strong market demand. The company has increased production of this flavor to meet consumer needs.
- SOCIÉTÉ EL FARAH specializes in producing 2-liter beverages, achieving notable sales in this size across various flavors.
- Production Boissons Gazeuses HELLAL KHAYREDDIN focuses on 0.33-liter beverages, carving out a unique niche.
- SARL BILARAN adopts a diversification strategy, producing a variety of sizes and flavors, while also pursuing a market penetration strategy by distributing its products in Adrar and several western Algerian provinces.

V.7 Enabling Factors: These primarily consist of government policies and incentives aimed at promoting investment and enhancing the competitiveness of local industries. As Tadjenanet is classified within the High Plateaus Region, it benefits from several advantages:

- Reduced social security contributions, from 35% to 12.5% of the base salary;
- Tax exemptions for 10 years for enterprises registered with ANDI from the start of their operations;
- Exemption from customs duties and related taxes;
- Preferential access to industrial and commercial land, with three industrial zones already allocated to investors, including five companies operating within the soft drink industry cluster.

VI. Results Analysis

The study reveals that the soft drink manufacturers located in Tadjenanet have formed a highly structured and functionally integrated industrial cluster. This integration is reflected in the presence of interconnected production firms and a dense network of suppliers of raw materials, packaging materials, labeling services, and logistics operators. The presence of such an organized industrial ecosystem ensures the continuity of production processes and enhances operational efficiency across all participating enterprises. This outcome directly corroborates the initial hypothesis, which posits that the geographic concentration of enterprises is associated with the availability of supporting industries.

Moreover, the extant empirical evidence demonstrates that firms belonging to the Tadjenanet cluster benefit from significantly reduced production and transportation costs. The strategic positioning of raw-material suppliers in close proximity to the manufacturing facilities, coupled with the presence of a robust and competitive freight transport fleet comprising over 40 trucks, contributes to the reduction of logistical expenses and the mitigation of supply disruptions. This cost advantage has been demonstrated to enhance the financial performance of

firms, thereby fortifying their competitive position within broader marketplaces. These findings lend support to the second hypothesis, which posits that cluster membership contributes to a reduction in production and transportation costs.

The analysis further suggests that enterprises operating within the cluster demonstrate significant advancements in production efficiency. This phenomenon is evidenced by several factors, including the persistent rise in employment levels, the establishment of novel production lines, the modernization of equipment, and the synchronization of production volumes with seasonal and regional market demands. These developments exemplify the dynamic learning environment cultivated by the cluster, as well as the spillover effects engendered by proximity and knowledge exchange among firms. The third hypothesis is confirmed by this empirical evidence; that is, the hypothesis which asserts that cluster firms achieve higher production efficiency.

Moreover, the study determined that the integration of production firms with supporting industries has enhanced overall competitiveness, particularly through improved product quality and expanded market outreach. The ready access to high-quality inputs, including flavorings, emulsifiers, and packaging, has contributed to enhancing product consistency. Furthermore, the efficient logistics have enabled firms to expand into southern and western Algerian regions, creating broader market opportunities. These results corroborate the fourth hypothesis, which posits that supporting industries enhance firms' competitiveness in terms of product quality and market expansion.

In summary, the findings emphasize the strategic importance of the Tadjenanet cluster as a catalyst for competitive strength, operational efficiency, and local economic development. The findings indicate that the cluster has evolved into a dynamic industrial system, demonstrating the capacity to generate collective advantages that align with Porter's competitive advantage framework. This underscores the cluster's significance as a model for regional industrial development in Algeria.

VII. Conclusion

This study concludes that industrial clusters are an effective tool for enhancing the competitiveness of enterprises, particularly in consumer goods sectors such as non-alcoholic soft drink manufacturing. The Tadjenanet cluster exemplifies how this model facilitates integration between various industrial actors, reduces costs, and increases operational efficiency through collaboration.

Furthermore, the cluster has created a business environment conducive to innovation and expansion, which has positively impacted local economic development and contributed to advancing national industrial policy goals.

Based on the findings, the following recommendations are proposed:

- Support public policies aimed at developing and expanding industrial clusters;

- Simplify administrative and tax procedures for companies within clusters;
- Encourage investment in complementary industries to deepen integration within the cluster;
- Promote a culture of innovation and knowledge exchange among firms to enhance sustainable competitiveness.

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