

Digitization of the Ministry of Trade: An Opportunity to Enhance Efficiency and Limit Informal Trade in Food Supply Chains

رقمنة وزارة التجارة: فرصة لتعزيز الكفاءة والحد من التجارة غير رسمية في سلاسل الامداد الغذائية

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Abstract:

Algeria's informal economy has expanded due to political instability, economic and security challenges, structural reforms, and corruption, resulting in the proliferation of parallel supply chains. In response, the Ministry of Trade has undertaken strategic measures, including the establishment of vigilance cells, stricter market monitoring, and the adoption of digital platforms to oversee the distribution of widely consumed food products. This study demonstrated that digitalization contributes to strengthening formal food supply chains by improving transparency, oversight, and efficiency, while reducing the existence of informal supply chains.

Keywords: Informal economy; The food supply chains; Informal supply chains; The Ministry of trade.

Jel Classification Codes: O17; R40

I- Introduction :

Algeria has experienced security, economic, and political disturbances, resulting in the creation of an environment where the informal economy thrives. This economy is characterized by informal supply chains that allow the diversion of goods and services from the formal market to the informal one, while also fostering conditions conducive to illicit activities.

In response, Algeria has implemented a set of measures and adopted targeted policies to reduce the adverse effects of the informal economy. These include streamlining administrative systems, easing regulatory constraints, and advancing the digitalization of various sectors to foster greater efficiency and transparency.

In this context, the Ministry of Trade has implemented a range of strategic interventions and comprehensive digital transformation initiatives aimed at mitigating the challenges posed by informal trade and enhancing the efficiency of formal supply chains. This raises a central research question:

How can digital technologies contribute to enhancing the efficiency of food supply chains?

To systematically address the research problem, the following subquestions are proposed:

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- What digital technologies has the Ministry of Trade adopted?
- What is the impact of digital technologies on the efficiency of food supply chains?

As a provisional response to the research problem, the following hypothesis has been formulated: the digitalization of the trade sector offers numerous opportunities that can significantly enhance efficiency and transparency in the trade system in general, and in food supply chains in particular.

The study aimed to enhance understanding of the digitization of the Ministry of Trade and its role in improving the efficiency of food supply chains.

To achieve the study's objectives and address the research problem, the study relied on the hypothetical-deductive method to ensure internal consistency, along with the analysis of data and reports

II. The Efficiency of Food Supply Chains and the Informal Economy Trap:

II-1 The informal economy

The informal economy refers to all types of economic activities conducted unofficially in the market, and thereby unseen by official authorities. There are many synonyms for the "informal economy," such as the shadow economy, black economy, hidden economy, or grey economy, each definition being marginally different from the others, depending on what it precisely deals with among the total spectrum of informal economic activities.¹

Conceptually, the notion of the informal economy has several definitions and interpretations that impact upon data collection and measurement of its size and monetary value. The economic activities taking place in the informal economy are mostly unrecorded and therefore difficult to measure.²

According to the definition adopted by the Algerian National Economic and Social Council, it refers to production operations, the exchange of products, and the provision of services that are not fully or partially subject to commercial, fiscal, and social laws, and which do not appear fully or partially in official statistics.³

Notably, it is important to distinguish between the black economy, which is characterized by illicit and criminal enterprises, it may include activities such as drug trafficking and illegal gambling, and the informal activities which comprise a significant number of legal and productive activities that occur outside official channels due to a variety of reasons, including regulatory burdens, taxation, and the desire for flexibility among participants. Consequently, the informal economy represents a complex and multifaceted section of the broader economic landscape, deserving of careful examination and understanding.⁴

However, in this paper, the focus is on legal and productive activities that occur outside official channels for various reasons, as the problem addressed concerns the regulatory frameworks that balance formalization incentives with economic realities and the development of Digital technologies aimed at formalization and inclusive economic growth.

There are several contributing factors to the emergence and development of the informal economy, the most important of which can be summarized as follows:⁵

- Low income levels, especially in the context of rising general price levels.
- High tax burdens.
- High complexity of administrative systems, regulations, and government restrictions.

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- Scarcity of goods, particularly subsidized goods.
- administrative corruption
- Inefficiency of regulatory and legal frameworks

The impacts of the informal economy on formal businesses can be both negative and positive. Commencing with the negative impacts, formal businesses are often hampered by the informal economy for at least three reasons: unfair competitive advantage over fully compliant businesses. This advantage stems from their non-compliance with labor regulations and tax or social security obligations, which reduces their labor and overall production costs.⁶

When businesses operating fully or partially in the informal economy have a major impact on formal enterprises, this can cause compliant formal enterprises to no longer comply with the legal rules of the game

- reduces the productivity of formal enterprises

The informal economy also has potentially positive impacts, such as high economic flexibility, stimulation of the local economy, and encouragement of entrepreneurship; it can function as an incubator where start-ups “test-trade” the viability of their ventures before deciding whether to register and become formal business enterprises. However, it also poses a threat to formal activities and can undermine economic planning and growth.⁷

Without a doubt, the expansion of informal supply chains is a key factor driving the growth of the informal economy; The majority of informal economy operations are connected to the formal sector through a range of forward and backward linkages and complex interactions⁸. Therefore, optimizing and improving the efficiency of these supply chains can play a crucial role in limiting the spread and scale of informal economic activities.

II-2 The Supply Chains: Concepts and Perspectives

The concept of a “supply chain” generally refers to the alignment and coordination of companies involved in delivering products or services to the market. It encompasses manufacturers, suppliers, transporters, warehouses, wholesalers, retailers, various intermediaries, and even the end customers themselves.⁹

The supply chain is all activities associated with the flow and transformation of goods from the raw materials stage, through to end users, as well as the associated information inflows. This includes material and information flows both up and down the supply chain. Therefore, the supply chain includes a whole horde of systems such as systems management, operations and assembly, purchasing, production schedule, order processing, inventory management, transportation, warehousing, and customer service. Supply chain is essentially a series of linked activities starting from the suppliers.¹⁰

A supply chain encompasses all the parties that are involved, directly or indirectly, in fulfilling a customer request.¹¹

represents all firms participating in the production and delivery of products or services, in other words creating the market-supply.¹²

Supply chains can be analyzed through five main perspectives, namely: functional and process oriented perspective, strategic perspective, systemic perspective, structural and network oriented perspective and relational perspective¹³:

- Functional and Process Oriented Perspective: The Supply Chain as a Set of Functions, Activities and Processes.

- The Strategic Perspective: The Supply Chain as a Value System and a Competitive Advantage

- The Systemic Perspective: The Supply Chain as a Dynamic System. In this sense, it defined as a system whose constituent parts are suppliers of materials, production facilities, distribution services, and customers connected by flows of material and information

- Structural and Network Oriented Perspective: The Supply Chain as a Network of Actors that is to say, a set of enterprises represented by nodes and connected by different types of relations.

- The Relational Perspective: The Supply Chain as a Set of Relations among suppliers, manufacturers, distributors, and retailers that facilitates the transformation of raw materials into final products.

Encompassed within this definition, we can identify three degrees of supply chain complexity:¹⁴

- A direct supply chain consists of a company, a supplier, and a customer involved in the upstream and/or downstream flows of products, services, finances, and/or information

- An extended supply chain includes suppliers of the immediate supplier and customers of the immediate customer, all involved in the upstream and/or downstream flows of products, services, finances, and/or information

- An ultimate supply chain includes all the organizations involved in all the upstream and downstream flows of products, services, finances, and information from the ultimate supplier to the ultimate customer

The current interest has sought to extend the traditional supply chain to include ireverse logistic, to include product recovery for the purposes of recycling, re-manufacturing, and re-use. Within manufacturing research, the supply chain concept grew largely out of two-stage multi-echelon inventory models, and it is important to note that considerable progress has been made in the design and analysis of two-echelon systems.¹⁵

The Supply chains aim to deliver what is needed, when it is needed, and where it is needed¹⁶ It encompasses all sectors, including the food industry sector; however, the latter is highly sensitive to factors like scarcity and the quick expiration patterns To ensure the smooth operation of the food supply chain, efficiency and effectiveness are crucial Any delay or misstep in this process can lead to food waste, financial losses, and disappointed customers

II-3 The Food Supply Chains Efficiency and the Trap of Informal Chains

The food supply chain focuses on monitoring flexibility, continuity, product quality, inventory management, and pricing policies, from upstream stages to the point of consumption. The key criteria for assessing the effectiveness and efficiency of the food supply chain can be summarized in the Eight levers of supply chain effectiveness

- Productivity : anything to do with efficiency - less time, effort and money.
- Simplicity : anything that eliminates or minimizes complexity
- Convenience : when and where i want something
- Risk reduction : financial , physical, and emontional including reputation
- Fun and Image: tangible and intangible aesthetic look, feel, attitude, and style that an offering conveys
- Price accumulation across the supply chain and waste prevention strategies
- Environmental Friendliness: is the process environmentally friendly, and the degree of extension of the supply chain in the reverse flow.

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- Coordination, information sharing, and the degree of integration within the supply chain it can improve functionality both through internal integration to facilitate seamless flows through internal supply chains and external integration to encompass suppliers and customers. Internal integration involves the planning and control systems of a company to integrate supply and demand along the company's own operations. External SCI refers to the extent to which the supply chain processes of a firm are integrated within the scope of upstream (customers) and downstream (suppliers) through focal companies. Whilst early SCI focused on the linear relationships and flows between customers and suppliers, more recent developments emphasise a non-linear network approach to integration.¹⁷

It is crucial to consider these levers at each stage of the supply chain. Their operation can be illustrated using a direct supply chain, as shown in Table 01."

Table 01 : The levers of supply chain effectiveness

		stage of the supply chain		
		supplier	company	consumer
levers of supply chain effectiveness	Productivity			
	Simplicity			
	Convenience			
	Risk reduction			
	Fun and Image			
	Price accumulation			
	Coordination, information sharing			
	Environmental Friendliness			

Source: Prepared by the authors

The efficiency of supply chains may face a competitive obstacle from informal supply chains due to price accumulation outside the influence of taxes and other regulatory costs. This negatively affects the growth of the formal economy and encourages a shift toward the informal economy. The main differences between formal and informal supply chains can be illustrated in Table 2.

Table 2: Differences between formal and informal supply chains

Characteristics	Formal Supply Chains	Informal Supply Chains
Organization	Organized	Unorganized
Degree of adherence to laws and regulations	Compliant	Non-compliant
Financial dealings	Cash and financial institution transactions	Cash transactions

Workers' rights	Protected by law	Unsecured and prone to many violations
Price accumulation	Depends on the efficiency of the chain	Often low due to no tax or regulatory obligations

Source: Prepared by the authors

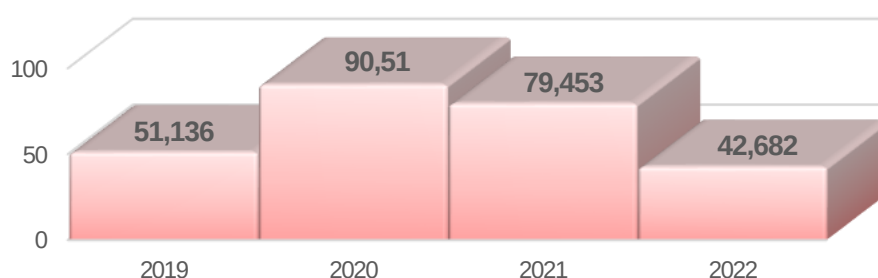
Across the table, it is evident that formal supply chains incur higher costs than informal chains, the most significant of which include customs duties, labor-related expenses, social security contributions, and additional costs associated with tax obligations and other regulatory fees. Therefore, the efficiency of supply chains cannot be fully achieved without ensuring a formal regulatory environment, which is a goal pursued by most countries in general, and Algeria in particular.

III- Digitization of the Trade Ministry and the Organization of Food Supply Chains :

To support economic growth, Algeria has implemented several policies and measures to reduce the negative effects of the informal economy by streamlining administrative systems and regulations, easing government restrictions, and digitizing several sectors.

The Ministry of Trade has taken various measures to reduce the informal economy, by establishing vigilance cells for controlling several flows in the domestic market and supervising border crossings, as a result of this the level of hidden business activity decreased by 52.8% between 2020 and 2022, as shown in Figure 1. It should be noted that 2019 recorded the lowest volume due to the exceptional nature of that year, as it marked the peak of the COVID-19 pandemic during which most trade exchanges came to a halt.

Figure 1: Hidden Annual Turnover



Unit: Billion Algerian Dinars

Source: Prepared by the authors based on data from (The Ministry of Trade)¹⁸

The Ministry of Trade has also technically supported these measures by establishing eleven platforms, along with a joint platform with the Ministry of Agriculture. Through these, it digitized the distribution network of widely consumed food products, the import process from the certificate of compliance to the monitoring of banking domiciliation, and created a digital database of storage facilities such as warehouses and cold rooms, including their storage capacity and locations through the Global Positioning System (GPS). It has also enhanced price monitoring and the management of files related to lawbreaker

These platforms enabled the creation of digital data on trade flows and the formation of a digital database for official supply chains. Below we present a detailed explanation of the Distribution Platform for Widely-Consumed food Products (thirteen items) and the two platforms for controlling subsidized milk.¹⁹

III-1 The Distribution Platform for Widely-Consumed food Products

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This platform was established in 2023 to ensure the monitoring of food product flows and achieve flexibility to avoid scarcity risks. It serves as a digital logbook for tracking the flow of thirteen widely-consumed food products within extended supply chains, either on a daily or periodic basis. The supply chains monitored through this platform can be summarized in Table3

Table 3: Economic operators within direct supply chains for widely consumed goods

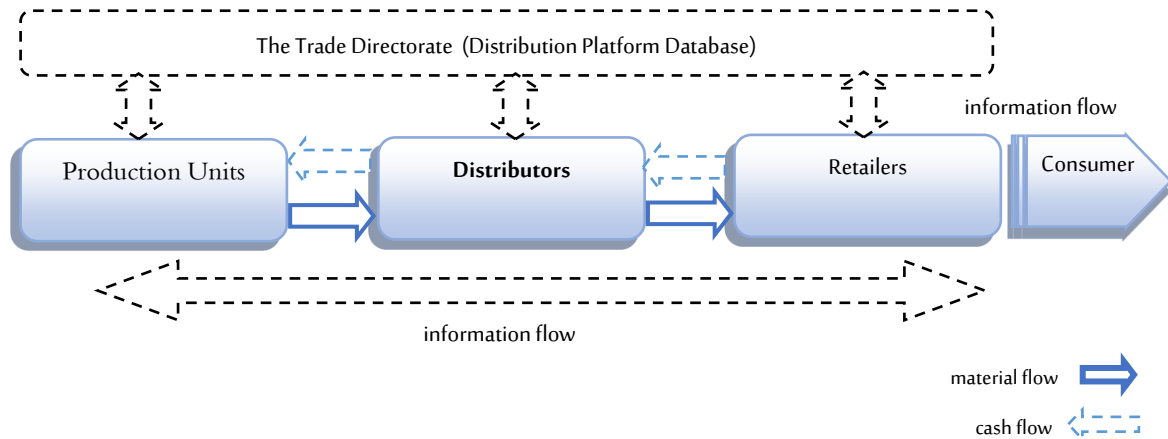
Goods	Production Units(National Level)	Distributors (National Level)	Retailers
Sugar	08	338	
Oil	08	553	
Coffee	131	608	
Baking powder	17	322	
Soft wheat flour	475	11319	
Hard wheat flour	192	7207	
Pasta	60	957	
Infant formula	11	128	
UHT milk	11	517	
Dried vegetables	173	1300	
Mineral water	62	848	
Canned tomatoes	35	450	
Non-alcoholic beverages	218	1978	
Total	1401	11319	

Source: Prepared by the authors based on data from (The Ministry of Trade)²⁰

The table illustrates that main goods are monitored through the platform, which tracks 1,401 factories . These units declare periodically or daily the plant's production capacity, actual output, price structure, stock status, and the quantity sold along with its destination, thus providing complete information about the distributor and the quantity sold to them. In addition, the platform monitors 26,525 distributors, who declare on a daily or periodic basis the quantities purchased and sold, stock status, and price structure

As seen in Figure 2, the distribution platform enables the tracking of extended supply chains, where the flow is monitored from the factory to guarantee it reaches the end user. While blocking any flow toward the informal supply chains, it also monitors the price structure and its accumulation throughout the supply chain

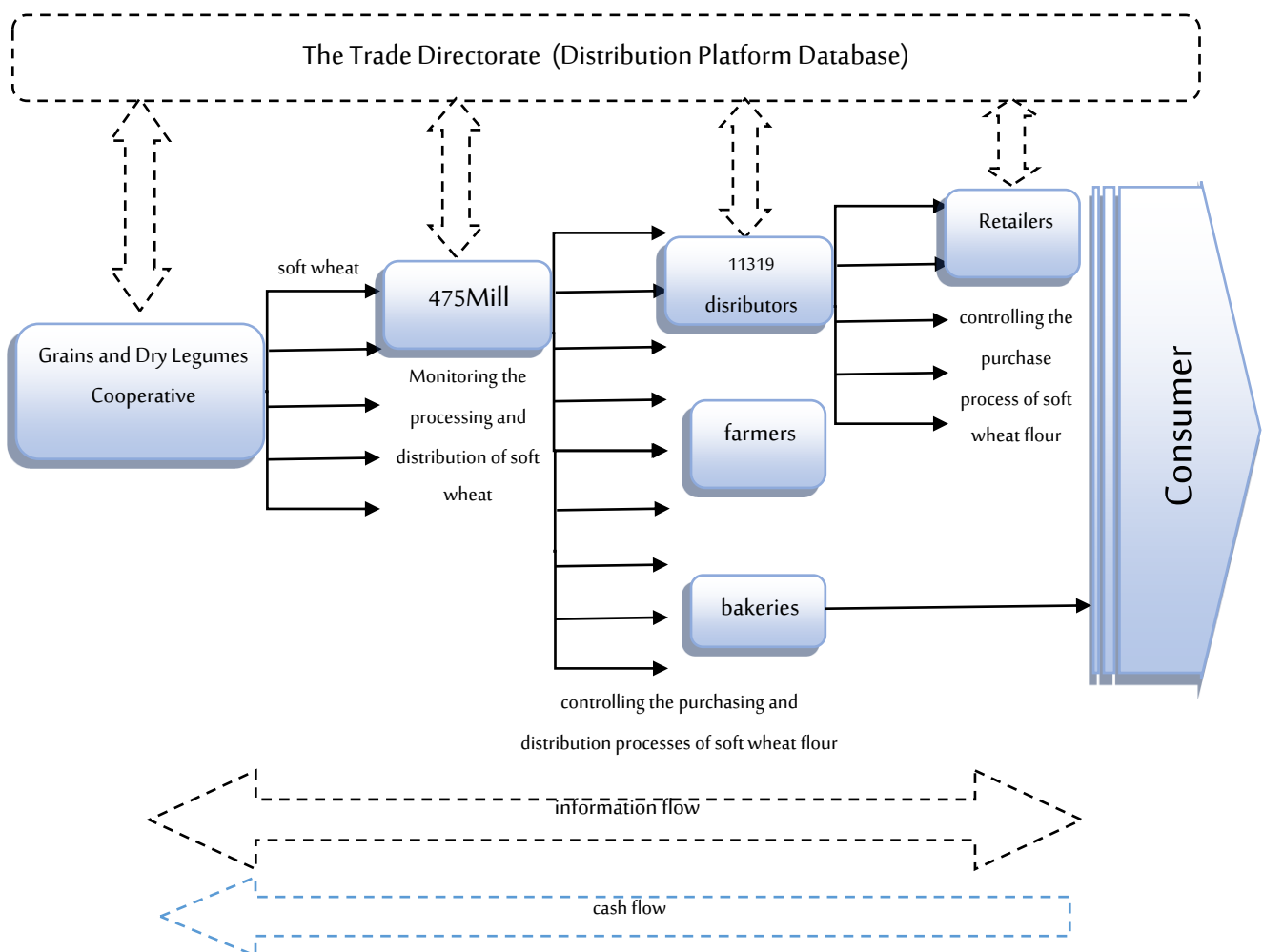
Figure 2: Direct supply chain



Source: Prepared by the authors

A simplified and generalized supply chain model for widely consumed goods is shown in Figure 2. However, the supply chains under monitoring differ from one product to another. To further illustrate the platform's mechanism, Figure 3 presents the case of soft wheat flour.

Figure 3: Extended Supply Chain for Soft Wheat Flour



source:Prepared by the authors

The flow within the supply chains of soft wheat flour is monitored on a daily and monthly basis to ensure that no flow occurs outside the official supply chain Regular

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monitoring is carried out to build a database on the technical production sheet of mills, which identifies the output ratio (flour, bran, and by-products) from soft wheat. Subsequently, daily and monthly declarations by mills, distributors, and the Cereals and Pulses Cooperative are monitored, in addition to overseeing the transparency and integrity of commercial transactions through invoice tracking.

III-2 The National Subsidized Milk Tracking Platform

This platform was created in 2023 to monitor the flow within the extended supply chain of subsidized milk. It is a joint platform between the Ministry of Agriculture (represented by the National Milk and Dairy Office – ONIL) and the Ministry of Trade. It was created to complement the platform of the Ministry of Trade for monitoring pasteurized milk packaged in sachets (LPC).

In their entirety, these two platforms provide comprehensive information on all economic operators involved in the subsidized milk industry (see Table 4). Through these platforms, the quantity of milk powder distributed by ONIL to dairies is tracked, ensuring its processing and delivery to distributors, who in turn supply the received quantity to retailers, with transactions verified through a delivery note endorsed by the retailers.

Table 4: Database of the Subsidized Milk Supply Chain

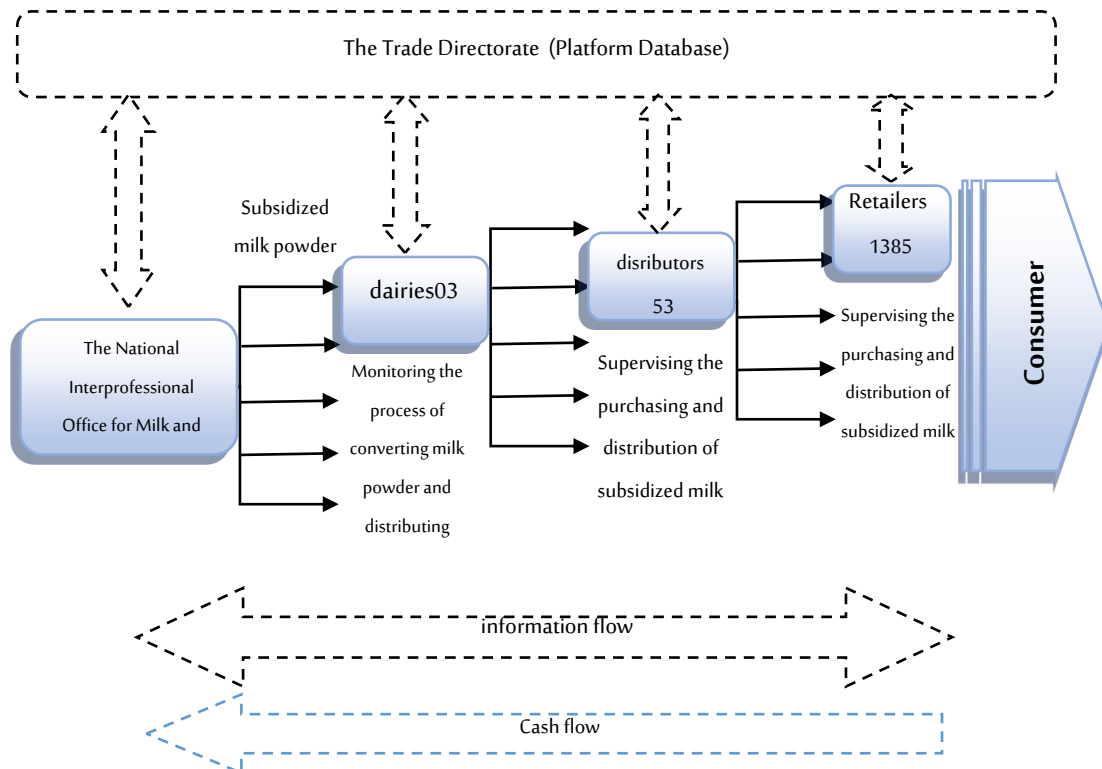
Supply chain components	The National Interprofessional Office for Milk and Dairy Products	dairies	distributors	Retailers
The information requested	Declaration of the quantity of milk powder distributed to dairies	The production capacity of the dairy The milk technical sheet indicating the milk powder ratio per 1 liter of milk Quantity of milk powder received production achieved Quantity of milk sales Stock status	Quantity of purchases Quantity of sales The delivery note that verifies the sales destination	Ensuring the honest verification of the delivery note regarding the price and quantity purchased

Source: Prepared by the authors based on data from (Ministry of Trade) ²¹

The mechanism of the two platforms and their impact on the subsidized milk supply chain can also be illustrated, particularly in terms of closing channels that allow goods to flow into informal supply chains. Relevant statistics for Bouira Province are presented in Figure 4

The milk tracking platforms allow for the monitoring of various flows and ensure the transmission of information to the Ministries of Trade and Agriculture. This helps prevent any diversion from the official and authorized supply chain into hidden channels, which could otherwise hinder the delivery of milk to the final consumer, distort its price, and create scarcity crises

Figure 3: Subsidized milk supply chain



Source: Prepared by the authors

IV- Conclusion:

The rapid acceleration of technological advancements is profoundly reshaping Algeria economic landscapes, with significant implications for the informal economy. Within this context, the importance of integrating informal activities into the formal economy has emerged through adopting a comprehensive strategy to enhance transparency and accountability, and to improve the regulatory and investment environment, in order to support the efficiency of supply chains in general and food supply chains in particular. The key findings of the study can be summarized as follows:

- The supply chain includes all actors involved directly or indirectly in the flow of goods, and its primary aim is to deliver what is needed, when it is needed, and where it is needed.

- The main driver of the informal economy is the proliferation of informal supply chains. Therefore, organizing supply chains and improving their efficiency helps limit the spread and growth of the parallel economy. The effectiveness of establishing vigilance cells and enforcing stricter procedures to monitor the flow of goods in the domestic market, as well as to supervise border crossings, depends on the comprehensive adoption of digital technologies.

- The Ministry of Trade supported these measures technically by creating eleven platforms, along with a joint platform with the Ministry of Agriculture, through which it digitized the distribution network of widely-consumed food products and various activities.

Accordingly, digital technologies continue to advance, and keeping up with them can enhance the efficiency and transparency of the trade and food supply chains. This study opens new avenues for research as outlined below.

- The role of cloud computing in improving coordination and collaboration among supply chain elements.

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- Analyzing the feasibility of digital integration of information systems within the supply chain
- Exploring opportunities to apply Blockchain technologies to enhance transparency and trust in supply chains

Referrals and references:

- 1 - Jeong, M. (2020). *The Informal Economy and Economic Growth of Russia*. Korea Institute for International Economic Policy , p01.
- 2 - Smit, S., & Musango, J. K. (2015). Towards connecting green economy with informal economy in South Africa : A review and way forward. *Ecological Economics*, 116, 154- 159. <https://doi.org/10.1016/j>
- 3 - عامر, ع., توهامي, م. ر. (2020). انعكاسات جائحة كورونا على الاقتصاد الموازي في الجزائر 2020. *مجلة الميادين الاقتصادية* 3(1), 95-118, ص 98.
- 4 - Abu Alfoul, M. N., Khatatbeh, I. N., & Jamaani, F. (2022). What Determines the Shadow Economy? An Extreme Bounds Analysis. *Sustainability*, 14(10), <https://doi.org/10.3390/su14105761>
- 5- يحيوي, ن. (2016). الاقتصاد الموازي في الجزائر: الحجم، الأسباب و النتائج. *مجلة الدراسات المالية المحاسبية والإدارية*. 6(6), 290-307.
- 6 - Williams, C. (2017). The Informal Economy as a Path to Expanding Opportunities. *SSRN Electronic Journal*. <https://doi.org/10.2139/ssrn.3209133>
- 7 - Williams, C., & Martinez, A. (2014). Is the informal economy an incubator for new enterprise creation? A gender perspective. *International Journal of Entrepreneurial Behavior & Research*, 20(1), 4- 19. <https://doi.org/10.1108/IJEBr-05-2013-0075>
- 8- Smit, S., & Musango, J. K. (2015).op.cite
- 9- Mihai, F. (2013). DEFINING THE CONCEPT OF SUPPLY CHAIN MANAGEMENT AND ITS RELEVANCE TO ROMANIAN ACADEMICS AND PRACTITIONERS. *Amfiteatru Economic*, 15(33), 74- 88, p75.
- 10 - Jawabreh, O. (2023). The Influence of Supply Chain Management Strategies on Organizational Performance in Hospitality Industry. *Applied Mathematics & Information Sciences*, 17(5), 851- 858. <https://doi.org/10.18576/amis/170511>
- 11 - Siti-Zaleha Omain, Hamid, A. B. A., M Noran, & Norzafir Md Salleh. (2008). *Supply Chain Management practices in Malaysian manufacturing firms*. Unpublished. <https://doi.org/10.13140/2.1.3746.1448>
- 12 - Delia, B. (2011). THE ADOPTION/ADAPTATION OF THE « SUPPLY CHAIN » CONCEPT IN ROMANIAN. *The Annals of the University of Oradea Economic Sciences*, 1(2), 650- 660, p658.
- 13 - ZOUAGHI, I, & LAGHOUAG, A. (2021). A Research Note on Defining the Concept of Supply Chain. *International Journal of Scientific Engineering and Science*, 5(19), 6- 10, pp 6-8
- 14 - Mentzer, J. T., DeWitt, W., Keebler, J. S., Min, S., Nix, N. W., Smith, C. D., & Zacharia, Z. G. (2001). DEFINING SUPPLY CHAIN MANAGEMENT. *Journal of Business Logistics*, 22(2), 1- 25. <https://doi.org/10.1002/j.2158-1592.2001.tb00001.x> , p04.
- 15 - Beamon, B. M. (1998). Supply chain design and analysis: *International Journal of Production Economics*, 55(3), 281- 294. [https://doi.org/10.1016/S0925-5273\(98\)00079-6](https://doi.org/10.1016/S0925-5273(98)00079-6), p282.
- 16 - عفيصة, ع. ا. (2017-2018). نموذج مقترح لتصميم وإدارة سلسلة الإمداد لشبكة مؤسسات دراسة تطبيقية لشبكة مؤسسات بالجزائر. *أطروحة دكتوراه*. الجزائر: كلية العلوم الاقتصادية والتجارية وعلوم التسيير جامعة باتنة، ص12.

17 - Shin, S., Wang, Y., Pettit, S., & Abouarghoub, W. (2024). Blockchain application in maritime supply chain : A systematic literature review and conceptual framework. *Maritime Policy & Management*, 51(6), 1062- 1095 , p1064
<https://doi.org/10.1080/03088839.2023.2234896>.

18 - Ministry of Trade. (2024). *Report on monitoring activities*. Algeria. Retrieved June 27, 2024, from <https://www.commerce.gov.dz/statistiques/collection/statistiques-diverses>

19 - Ministry of Trade. (2024). *Ministry of Trade and Export Promotion Portal*. Retrieved June 25, 2024, from <https://portail.commerce.gov.dz/>

20 - Ministry of Trade. (2024). *Platform for the distribution of widely consumed goods*. Algeria. Retrieved June 25, 2024, from <https://portail.commerce.gov.dz/proxy/72f44d8d/http/10.10.15.85/login>

21 - Ministry of Trade. (2024). *Subsidized milk monitoring platform*. Retrieved July 4, 2024, from <http://pdl.onil.dz/mcpe>