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Understanding Supply Chain Knowledge Mobilization Barriers From the Middle-Range Perspective: An Empirical Investigation of Argentina's Agri-Food Industry

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ABSTRACT

Despite considerable research attention to supply chain knowledge mobilization (KMob) barriers, understanding of why, how, and when they emerge in practice remains limited. We address this knowledge deficit by using middle-range theory (MRT) as a theoretical lens to examine supply chain KMob barriers in their naturally occurring environment. Drawing on 42 in-depth, semi-structured interviews with Argentinian agri-food supply chain (AFSC) practitioners, we present novel insights into the emergence of AFSC KMob barriers. First, our findings indicate the prevalence of 11 individual, intra-organizational, and inter-organizational KMob barriers in Argentinian AFSCs. Second, Argentina's political, economic, social, technological, legal, and cultural (PESTLC) environment contribute to these barriers. For example, the cultural environment, characterized by strong hierarchy and weak intellectual autonomy, may have negative effects on AFSC practitioners' KMob behaviors and perceptions, resulting in resistance to knowledge sharing, while long-term political and economic instability poses challenges for intra- and inter-organizational KMob. Third, these 11 KMob barriers elicit both semantic and pragmatic knowledge boundaries that thwart AFSC KMob. Our study extends the applicability of MRT to supply chain KMob research and provides a framework for better understanding KMob barriers. The study has important implications for agricultural research institutions and focal companies of local AFSCs.

1 | Introduction

Agri-food supply chains (AFSCs) can be simply defined as linking activities from "farm-to-fork" (European Commission 2020). They include stakeholders such as farmers, processors, wholesalers, distributors, and retailers, who are responsible for providing growing populations with safe, nutritious, and high-quality food, and managing rising energy demands (Zhao, Vazquez-Noguerol, et al. 2024). For example, at the farming stage of vegetable production, field preparation, sowing, fertilization, irrigation, weeding, managing pests and diseases, and harvesting are normally required to produce sufficient vegetables for consumption. At the processing stage, fresh vegetables are cleaned, packaged, and preserved or tinned, depending on buyers' requirements. At the distribution stage, vegetable products are transported to distribution centres and warehouses, or directly to retailers. Finally, consumers purchase these products from grocery stores, restaurants, cafeterias, and other food service establishments (Wowak et al. 2022). Flows of financial, information, material, and technology traverse various stages of AFSCs to support their sustainable development (Lowrey and Boyer 2024). However, increasing challenges posed by climate change, population growth, and environmental degradation are making

it more difficult for AFSCs to provide sufficient food for all. For example, the world's population is expected to increase by approximately 2 billion in the next 30 years, from the current 8 billion to 9.7 billion in 2050 (United Nations 2024). As a result of rising population and income levels, unless innovative solutions are found, the environmental effects of the agri-food system are likely to increase by 50%–90%, thereby exceeding planetary boundaries defined as safe operating spaces for humanity (Springmann et al. 2018). To feed more people, current global agri-food production must be increased by 30%–62% by 2050, taking account of climate change and populations at risk of hunger (Van Dijk et al. 2021). Key to alleviating the competing demands of population growth, food production, and depletion of natural resources is disseminating knowledge and innovations across AFSCs (European Commission 2019). For example, agricultural knowledge hubs are being built to foster knowledge mobilization (KMob) among communities of farmers (UNDP 2019). KMob is the process of building interrelationships to access and use knowledge. Effective KMob across AFSC stakeholders plays an important role in enhancing knowledge flows, strengthening relationships between stakeholders in KMob communities, such as agricultural research institutions, universities, and farms, and promoting cross-border interconnections, thereby helping farmers and rural communities to solve current and future challenges (Chen et al. 2018).

However, various barriers hamper KMob in AFSCs. First, farmers and their communities are located mainly in rural areas, whereas agricultural research institutions and supermarkets are situated in city centers. This geographical dispersion makes sharing context-specific knowledge more difficult. Second, owing to a lack of participatory processes, farmers perceive limited practical benefits from agricultural innovations, with negative impacts on researchers. For example, agricultural researchers may provide potential solutions to farmers to tackle real-world problems, but farmers may be unable to apply these solutions owing to limited understanding or lack of detailed guidance. Most farmers prefer to participate in the KMob process, rather than having knowledge imposed on them. Third, governments seek to foster KMob through formal and informal education, but this is not appropriately customized. Fourth, AFSC practitioners must understand both the "know-what" and the "know-how" whilst also valuing the "know-why" particularly when introducing new agricultural techniques (Son et al. 2019). The inefficiency of AFSC KMob has sparked scholarly interest in three main themes: identification and analysis of barriers to AFSC KMob, capacities and resources to leverage it effectively, and strategies to tackle the barriers and enhance capacities. For example, joint decision making and joint sense making may foster trust between buyer and supplier, thereby facilitating AFSC KMob (Revilla and Knoppen 2015). Social media usage fosters KMob at both team and organizational levels and benefits individuals' job performance (Cui et al. 2020). Kent et al. (2023) highlight how co-location of manufacturing impacts KMob in collectivist and individualist cultures, with positive effects in the former and none in the latter.

Despite continued attention from scholars and practitioners, deeper understanding is hampered by the fragmented nature of supply chain KMob, coupled with diverse scholarly interests and the absence of a holistic perspective. Since supply chain KMob is a multilevel, multi-faceted issue involving human and non-human factors, a holistic perspective is essential when seeking to understand the barriers (Liu 2020). Existing studies focus on identifying KMob barriers in different contexts (Ghobadi and Mathiassen 2016; Salehi and Sadeq Alanbari 2023), categorizing them (Riege 2005), using various quantitative measures to prioritize and identify the key ones (Nazam et al. 2020), and tackling them from technological, organizational, and other perspectives (Riege 2007). However, these studies all neglect to explore how and why KMob barriers emerge (Cerchione and Esposito 2016). Since KMob networks involve relationships between different actors mobilizing knowledge at single or multiple levels, a deep understanding of the mechanisms causing KMob barriers will contribute to effective KMob. Based on a review of 20 years of influential KMob literature, Barley et al. (2018) call for action on KMob by capturing multi-level KMob networks. Thus, in this study, we seek to understand AFSC KMob barriers from a multi-level KMob network perspective and identify the mechanisms through which they are manifested. Against this backdrop, we seek to answer three interrelated research questions to advance understanding of KMob:

1. What are the barriers to KMob in AFSCs?
2. Why and how do these barriers emerge and impede AFSC KMob?
3. When do they emerge and impede AFSC KMob?

To answer these questions, we conducted a qualitative, inductive study capturing AFSC KMob barriers in Argentina, which offered three key advantages. First, Argentina is a major producer of soybean, corn, wheat, beef, and wine (Donghi and Eidt 2024), so these types of AFSCs have been well explored. However, it is less widely known that the country also plays a critical role in global vegetable production. For example, it produced 3.9 million tons of vegetables in 2022, being ranked 30th globally and 2nd among South American countries (World Population Review 2024b). Moreover, its crop yields of tomatoes and potatoes are ranked highest in South America. This important role has received relatively little attention, motivating us to explore KMob issues in Argentinian vegetable supply chains. Second, supply chain KMob has been widely explored across various countries, including Brazil, Spain, South Korea, and the USA (Paiva et al. 2008; Bustinza et al. 2010; Choo et al. 2015; Kim et al. 2015), whereas Argentina has been rarely investigated, making it uniquely suited to identifying barriers to AFSC KMob deeply relevant to its environments. For example, it has a long history of political and economic instability, with significant annual growth fluctuations (Santander 2024). Third, to explain AFSC KMob barriers in a multi-level KMob network that has not yet been rigorously studied, we required sufficient data. Our previous involvement in a 5-year cross-country collaborative project had provided us with wide connections with Argentinian AFSC stakeholders, which would help us to find sufficient AFSC practitioners to interview. We adopted various methods to address our three research goals. First, to identify AFSC KMob barriers, we conducted 42 semi-structured interviews with AFSC practitioners in Argentina and analyzed the data using grounded theory. We categorized the barriers into three distinct groups: individual, intra-organizational, and

inter-organizational. Second, to gain insights into the mechanisms impeding AFSC KMob, we connected KMob barriers with knowledge boundaries, as the former may amplify the latter. Knowledge boundaries represent differences in understanding and expertise between individuals, between groups, and between organizations (Hsu et al. 2014), whereas KMob barriers are obstacles that prevent knowledge from being effectively transferred or used (Zhao, Chen, et al. 2023). We believe that KMob barriers may strengthen differences between individuals and between organizations. Third, to understand in what contexts these barriers may emerge and impede KMob, we adopted middle-range theory (MRT), which would help us to consider AFSC KMob barriers in a specific environment (Craighead et al. 2016, 2024). MRT differs from other theories in seeking to understand when and how actions lead to results (Bourgeois 1979). This made it appropriate for our study because AFSC KMob involves translating and re-forming knowledge from one domain to another and requires contributions from multiple perspectives, such as human resource, technological, and organizational viewpoints (Zhao, Liu, et al. 2023).

Our findings make significant theoretical and managerial contributions. First, with regard to the former, we take an initial step in illustrating AFSC KMob barriers by linking them with Argentina's political, economic, social, technological, legal, and cultural (PESTLC) environments. Previous studies have considered the effects of technological, legal, or cultural environments on supply chain KMob. For example, Droge et al. (2003) propose that high technological turbulence has positive effects on knowledge creation and application, and Chiu et al. (2018) examine the impact of a collectivist cultural environment on KMob in a high-tech supply chain. However, few studies have linked KMob with a country's economic, social, and political environments, nor developed a holistic understanding by linking a country's PESTLC environments. The latter is essential because individuals, organizations, and supply chains reside within this broad context, which shapes individuals' KMob behaviors and perceptions and organizational and supply chain KMob strategies. In this study, we make several insightful propositions relating to the value of PESTLC environments for AFSC KMob. For example, we propose that long-term instability in Argentina's political and economic environments raises significant barriers to AFSC practitioners adopting advanced technologies, and therefore poses challenges to intra- and inter-organizational KMob. Second, our study contributes to understanding how PESTLC environments shape individual, intra-organizational, and inter-organizational KMob barriers and further impede AFSC KMob. Third, our study appears to be the first to apply MRT to understand AFSC KMob. With regard to managerial contributions, we make suggestions for agricultural research institutions and focal companies of local AFSCs, since the former are predominantly responsible for conducting KMob activities in AFSCs and the latter have the power to coordinate AFSC activities. For example, we provide four practical guidelines to help agricultural research organizations promote AFSC KMob.

In the remainder of this paper, we begin by reviewing supply chain KMob, presenting our theoretical framework, and identifying current research gaps. We then explain our research methodology, our empirical data collection process in Argentina, and our analytical approach. We explore various AFSC KMob barriers relevant to the levels of supply chains, organizations, and individuals, before discussing our findings, highlighting our contributions, and drawing some conclusions.

2 | Literature Review

In this section, we review relevant supply chain KMob literature on KMob definitions and barriers, empirical studies, and unique characteristics of Argentina's AFSCs. We then develop a theoretical framework to guide our research through the theoretical lens of MRT and identify several research gaps.

2.1 | Empirical Studies Relevant to Supply Chain KMob

Before exploring supply chain KMob, an understanding of KMob is necessary. KMob has been widely explored across disciplines, leading to the emergence of similar terms and concepts with significantly overlapping meanings. These include knowledge exchange, transfer, sharing, dissemination, translation and utilization, and knowledge-to-action (KTA), which all revolve around mobilizing research evidence for policy and practice (Mallidou et al. 2018). The term "KMob" is used in this study because mobilization is multi-dimensional, long-term, and often political in nature (Golhasany and Harvey 2023). Simply defined as the movement of knowledge between entities, KMob can be described in terms of "four rights": disseminating the right information to the right people in the right format at the right time (Levin 2008). According to the SHRC (2019), KMob means creating, facilitating, and maximizing reciprocal knowledge flows between researchers, policymakers, knowledge brokers, and practitioners. Venkitachalam and Bosua (2014) define it as the process of connecting and encouraging people to share tacit and explicit knowledge, which ultimately enhances decision making. However, these definitions either lack detail or present an incomplete KMob process, making them inapplicable in this study. Thus, we adopt Bennet and Bennet's (2013, 15) KMob definition, which includes detailed processes, purpose, and scope: "KMob is the process of creating value or a value stream through the creation, assimilation, leveraging, sharing and application of focused knowledge to a bounded community."

Today's supply chains are multi-stakeholder systems characterized by flows of knowledge, financial transactions, materials, and technology. In such complex systems, supply chains' success and stakeholders' performance truly rely on efficient mobilization of knowledge across diverse supply chain members. Therefore, supply chain KMob has attracted considerable scholarly attention. Table 1 summarizes empirical research on supply chain KMob. In selecting these papers, we applied four criteria. First, the selected papers must have been published in top-tier, empirically focused journals (*Decision Sciences, Journal of Business Logistics, Journal of Operations Management*, and *Journal of Supply Chain Management*) included in *The SCM Journal List*, which is an annual ranking of universities' supply chain management (SCM) research outputs based on leading SCM journals (The SCM Journal List 2024). Second, the selected papers should clearly focus on supply chain KMob, including explorations of different stages of supply chain KMob from individual, team,

TABLE 1 | Representative empirical research on supply chain KMob.

Study	Journal and issue: volume	Context (country of focus)	Mechanism(s)	Theory adopted	Major findings
Droge et al. (2003)	*Decision Sciences* 34:3	Manufacturers (not specified)	Context variables	Knowledge-based view (KBV), contingency theory	Firm size has no effect on either knowledge construct; high technological turbulence is positively related to both knowledge creation and knowledge application
Hoegl et al. (2003)	*Decision Sciences* 34:4	Software development companies (Germany)	Individual knowledge networks	Social capital theory	The team's perceptions of the organizational knowledge-sharing climate, networking preference, and perceptions of importance of networking positively affect individuals' network building
Janz and Prasarnphanich (2003)	*Decision Sciences* 34:2	Not specified (USA)	Knowledge-centred culture	Organizational learning theory	Organizational climate and more cooperative learning positively influence knowledge creation and dissemination
Sabherwal and Becerra-Fernandez (2003)	*Decision Sciences* 34:2	National Aeronautics and Space Administration (USA)	Internalization, externalization, socialization and combination	Organizational learning theory	Internalization and externalization impact on perceived effectiveness of individual-level KM; socialization and combination influence perceived effectiveness of KM at group and organizational levels, respectively
Sarin and McDermott (2003)	*Decision Sciences* 34:4	High-tech development firms (not specified)	Team leader characteristics	Not specified	A democratic leadership style, initiation of goal structure by the team leader, and leader's position in the organization are positively related to team learning
Teigland and Wasko (2003)	*Decision Sciences* 34:2	Europe's largest information technology and management consulting company (Denmark, Finland, Norway, and Sweden)	Boundary-spanning communication	KBV and boundary-spanning theory	A positive relationship between boundary spanning communication and creativity and general performance
Wagner and Buko (2005)	*Journal of Supply Chain Management* 41:4	General supply chain (Germany and Switzerland)	Degree of knowledge sharing	Resource commitment theory	A firm's resource commitment positively influences its degree of knowledge sharing, and its communication efficiency and degree of knowledge sharing positively influence its performance

(Continues)

TABLE 1 | (Continued)

Study	Journal and issue: volume	Context (country of focus)	Mechanism(s)	Theory adopted	Major findings
Kahn et al. (2006)	*Journal of Business Logistics* 27:2	Supply chain business-to-business setting (USA)	Demand collaboration	Demand collaboration theory	Transaction-based collaboration elicits limited knowledge development, whereas technology-based collaboration brings about greater explicit knowledge development
Paiva et al. (2008)	*Journal of Operations Management* 26:1	Machine manufacturing and plastics industries (Brazil)	Internal and external knowledge	Resource-based view (RBV)	Internal information sources are positively related to external manufacturing knowledge; external information sources are positively related to internal manufacturing knowledge; external information sources are positively related to external manufacturing knowledge
Siemsen et al. (2008)	*Journal of Operations Management* 26:3	Knowledge-sharing context (USA)	Motivation, opportunity and ability drive knowledge sharing	Motivation-opportunity-ability framework	Interactions between motivation, opportunity, and ability drive knowledge-sharing behavior
Frazier (2009)	*Journal of Supply Chain Management* 45:2	Industry and firm contexts (USA)	Physical distribution functions	KBV	Important role of physical distribution functions in facilitating knowledge transfer and integration
Fugate et al. (2009)	*Journal of Operations Management* 27:3	Logistics operations context (USA)	KM	Knowledge responsiveness theory	A shared interpretation of knowledge among operational personnel mediates how knowledge is disseminated and used to design and implement a unified operational response to that knowledge
Anand et al. (2010)	*Journal of Operations Management* 28:4	Six Sigma black belt projects (USA)	Knowledge-creation practices	Organizational learning theory	Inclusion of softer, people-oriented practices for capturing tacit knowledge explains as much variance in project success as more analytically focused practices that capture explicit knowledge
Bustinza et al. (2010)	*Journal of Supply Chain Management* 46:3	Service-sector firms (Spain)	KM variables	KBV	Quality of knowledge positively affects outsourcing benefits, and the tacitness of knowledge negatively affects outsourcing benefits

(Continues)

TABLE 1 | (Continued)

Study	Journal and issue: volume	Context (country of focus)	Mechanism(s)	Theory adopted	Major findings
Chen et al. (2010)	*Decision Sciences* 41:1	Not specified (USA)	Knowledge lifecycle, inventory and acquisition strategies	Knowledge life cycle model	Firms with longer knowledge lifecycles, greater slack in workforce capacity, and better training efficiency face more difficult challenges in KM
Grawe et al. (2011)	*Journal of Business Logistics* 32:1	General supply chain (USA)	Knowledge synthesis	RBV and KBV	Knowledge synthesis and innovative logistics process are the key resources in developing operational flexibility
Li et al. (2011)	*Journal of Operations Management* 29:1–2	Distributor's entrepreneurial orientation (China)	Properties of dyadic relationships	Co-opetition theory	Cooperation and type of conflict have both individual and interactive effects on manufacturers' knowledge acquisition
Thomas et al. (2011)	*Journal of Supply Chain Management* 47:3	Buyer–supplier relationships (USA)	Time pressure and knowledge sharing	Time pressure coping mechanisms	Suppliers' use of time pressure coping mechanisms decreases buyers' willingness to share knowledge and exchange information
Letmathe et al. (2012)	*Journal of Operations Management* 30:3	Different forms of knowledge transfer (Germany)	Learning mechanisms	Self-observation theory	Transfer of explicit knowledge in combination with autonomous learning and self-observation or with autonomous learning, self-observation and additional outcome feedback is most beneficial in terms of manufacturing performance
Hora and Klassen (2013)	*Journal of Operations Management* 31:1–2	Incident firm and observing firm (not specified)	Perceived operational similarity and market leadership	Knowledge acquisition theory	Perceived operational similarity and market leadership significantly influence risk managers' likelihood of acquiring knowledge about possible causes of other firms' operational losses
Thomas et al. (2013)	*Journal of Supply Chain Management* 49:2	Interdependent buyer–supplier relationships (USA)	Level of interdependence	Social exchange theory	Increased interdependence leads to increased operational knowledge transfer activities between buyers and suppliers, and a win-lose negotiation strategy leads to decreased operational knowledge transfer activities between buyers and suppliers

(Continues)

TABLE 1 | (Continued)

Study	Journal and issue: volume	Context (country of focus)	Mechanism(s)	Theory adopted	Major findings
Liu et al. (2014)	*Journal of Operations Management* 32:3	Innovative technology products (USA)	Knowledge characteristics	KBV	The financial impact of technology products is stronger when firms have higher knowledge absorptive capacity, and more impactful and less diversified knowledge
Manuj et al. (2014)	*Journal of Business Logistics* 35:2	Logistics service providers and their customers (USA)	Inter-organizational learning	Organizational learning theory	Customers' and third-party logistics providers' contextual conditions may influence inter-organizational learning
Schoenherr et al. (2014)	*Journal of Business Logistics* 35:2	Manufacturing firms (USA)	Supply chains' KM capability	KBV	Both tacit and explicit knowledge influence supply chain performance, with the latter having a greater impact
Choo et al. (2015)	*Journal of Operations Management* 36:1	Metal casting manufacturers (USA)	Knowledge stock	Problem-solving orientation	Generative problem solving positively affects both internal and external knowledge stocks, while symptomatic problem solving negatively influences internal knowledge stock
Grawe et al. (2015)	*Journal of Business Logistics* 36:1	General supply chain (USA)	Boundary spanners' affective commitment	Boundary-spanning theory	Boundary spanners' affective commitment to customers leads to greater knowledge exchange between organizations
Kim et al. (2015)	*Journal of Supply Chain Management* 51:3	Small- and medium-sized suppliers of large conglomerates (South Korea)	Relative absorptive capacity, trust and innovativeness	Motivation-opportunity-ability framework	Suppliers perceived overlapping knowledge, cognitive congruence, and trust positively moderate the association between buyer-driven knowledge transfer activities
Kull and Ellis (2016)	*Journal of Business Logistics* 37:4	Buyer supplier relations (USA)	Buyer dependence and supplier integration	Organizational learning theory	Buyer dependence facilitates knowledge acquisition and use, and contributes to perceived supplier performance
Wang (2016)	*Decision Sciences* 47:3	General industry context (Taiwan—China)	Personal and environmental factors	Social cognitive theory and self-determination theory	Trust, relationship orientation, knowledge-sharing self-efficacy, and relative autonomous motivation are key factors influencing knowledge-sharing behaviors
Preston et al. (2017)	*Decision Sciences* 48:2	Buyer–supplier relationships (USA)	Social capital mechanism	Social capital theory	Relational social capital allows for transfer of knowledge from buyer to supplier

(Continues)

TABLE 1 | (Continued)

Study	Journal and issue: volume	Context (country of focus)	Mechanism(s)	Theory adopted	Major findings
Mehta and Mehta (2018)	*Decision Sciences* 49:3	Self-directed teams (USA)	Team goal orientation	Team goal orientation approach	Learning and performance related goal orientations positively influence team knowledge integration
Marques et al. (2020)	*Journal of Supply Chain Management* 56:1	Global food supply chain (UK)	Knowledge diffusion	Knowledge diffusion theory and social network theory	Relational and location homophily initially drive knowledge diffusion, and practice homophily is the principal driver of long-term knowledge diffusion
Agnihotri et al. (2022)	*Journal of Business Logistics* 43:2	Supply chain business-to-business setting (USA)	Social media's impacts	KBV	Supplier account managers' social media use increases their product and competitor knowledge; when perceived customer demand is high, the relationship between social media use and knowledge will be higher
Amaya and Holweg (2024)	*Journal of Operations Management* 70:3	A multinational energy firm (UK)	Algorithms	Knowing-in-practice view	Ability to sustain any improvement depends on adjustment of the knowledge regime, or the practices and structures that sanction knowledge
Donmez and Norheim-Hansen (2024)	*Journal of Supply Chain Management* 60:2	Supplier integration into product development (not specified)	Knowledge interdependencies at the product, supplier, and buyer supplier levels	KBV	Component modularity, supplier knowledge modularity, and knowledge complementarity construct effective coordination

or organizational perspectives in various contexts using various mechanisms. For example, Grawe et al. (2015) investigate effective knowledge exchange from a boundary spanner's perspective, and Wang (2016) explore environmental and personal factors that may influence knowledge-sharing behaviors. Third, we concentrated only on empirical papers, so literature reviews and theoretical and conceptual papers were excluded. For example, Briel et al. (2019) adopt social integration mechanisms to explore knowledge absorption from and with external partners. In their theory-building study, no data collection activities were undertaken to support their findings. Wowak et al. (2013) conduct a meta-analysis on supply chain knowledge and performance, and Carter (2008) reviews knowledge transfer. These studies were excluded from our analysis. Finally, two experienced professors with expertise in knowledge management (KM) and SCM were asked to review each paper to ensure that we had included appropriate studies based on our criteria. Our findings show that scholars and practitioners have explored supply chain KMob from four main perspectives. First, some have investigated individual (e.g., team leader, shop floor worker, and boundary spanner) characteristics, behaviors, skills, or networks and their effects on intra- or inter-organizational KMob. For example, Sarin and McDermott (2003) show that a democratic leadership, initiation of a goal structure by the team leader, and the leader's position within the organization are positively related to team learning. Amaya and Holweg (2024) illustrate that personal algorithm skills may accelerate human activity in a single task, and thereby improve knowledge work. Second, some researchers have explored the impacts of various mechanisms on supply chain KMob. These include the social capital mechanism, learning mechanism, levels of interdependence, team goal orientation, and motivation-ability-opportunity framework (Siemsen et al. 2008; Letmathe et al. 2012; Thomas et al. 2013; Kim et al. 2015; Preston et al. 2017). Third, some studies focus on environmental factors and their effects on supply chain KMob. For example, Droge et al. (2003) examine the impact of contextual variables on KMob. They show that high technological turbulence positively influences knowledge creation and application, respectively. Marques et al. (2020) differentiate the role of relational, location, and practice homophily in influencing knowledge diffusion. Their results indicate that the first two drive initial knowledge diffusion, and the latter drives long-term knowledge diffusion. Finally, some scholars focus on knowledge characteristics (e.g., tacitness and explicitness) and KM processes to improve KMob (Sabherwal and Becerra-Fernandez 2003; Fugate et al. 2009; Bustinza et al. 2010; Liu et al. 2014).

Among various understandings of factors influencing supply chain KMob, scholars have investigated barriers impeding supply chain KMob from the knowledge, personal, organizational, or environmental perspectives. For example, Thomas et al. (2013) explore knowledge transfer from an organizational perspective by setting this phenomenon in the contexts of buyer–supplier relationships. They posit that organizations always believe that a win-win negotiation strategy leads to an increase in intended information exchange, communication quality, and operational knowledge transfer activities, and that a win-lose negotiation strategy greatly decreases intended operational knowledge transfer activities. Also in relation to buyer–supplier relationships, Preston et al. (2017) propose that supplier knowledge enrichment is diminished as the length of the buyer–supplier relationship increases. Kim et al. (2015) develop a motivation-opportunity-ability framework to understand when buyer-driven knowledge transfer activities really work. They propose that a supplier's innovativeness negatively moderates the association between buyer-driven knowledge transfer activities and the supplier's operational performance improvement. Janz and Prasarnphanich (2003) examine relationships between an individual's self-management and cooperative learning. They find that low individual self-management may result in low levels of cooperative learning and thereby negatively influence KMob between knowledge workers. Finally, Wang (2016) indicates that personal knowledge sharing behaviors are influenced by the key factors of trust, relationship orientation, self-efficacy, and relative autonomous motivation regarding knowledge sharing.

2.2 | Unique Characteristics of Argentina's AFSCs

Our study involved collecting data from AFSCs in Argentina, which has a unique agricultural context. First, as the second-largest country in South America, it has rich natural resources for use as inputs for agriculture, including agricultural land and water resources. For example, in terms of total renewable water resources, Argentina was ranked 16th among 183 investigated countries, with access to 876.24 billion cubic meters per year (FAO 2021). With regard to agricultural land per person, Argentina is ranked 14th globally, with 3.3 agricultural hectares per person (Ritchie and Roser 2024).

Second, over the last two decades, the total factor productivity (TFP) of agriculture in Argentina has grown at an average annual rate of 1.4%, significantly slower than in other South American countries such as Brazil and Chile (OECD 2019). TFP is widely used to measure how much output can be produced from a given amount of input. It accounts for multiple inputs simultaneously, such as labor, capital, land, and other inputs, including fertilizers, seeds, water, and energy (Kryszak et al. 2023). For example, the annual average agricultural TFP growth rate in Brazil between the 2000s and 2020s is estimated to have been around 3.1%–3.5%, largely attributable to a steady increase in agricultural public research expenditure, the establishment of open agricultural trade policies, government promotion of agricultural product exports, favorable agricultural credit policies, and stable macroeconomic policies (Arias et al. 2017). Compared with Brazil, as a competing agricultural producer, Argentina's low TFP growth is impacted by various factors. First, heavy tax policies constrain the agricultural sector. For example, Argentina has the third highest rates of tax collection from export duties, whereas Brazil is ranked 25th (World Bank Group 2022). Second, dwindling public funding and private investment is threatening agricultural technological innovations. In Argentina, the National Institute of Agricultural Technology (INTA) is the major funding agency supporting agricultural research, development, and extension activities, representing around 60% of public agricultural spending in Argentina. The other 40% is provided by higher education institutions (Morgan et al. 2024). However, according to a recent report (STIP COMPASS 2023), non-competitive funding is provided by

Argentina's national system of science and technology, which includes INTA. Regarding private investments, the business sector provides 18.2% of overall funding for research and development in Argentina, significantly less than Chile's 35.8% and the 62.1% of other OECD countries (Galiani et al. 2021). Third, Argentina's labor market is characterized by inflexible wage determination and high redundancy costs measured in weeks of salary, resulting in harsher dismissal and hiring regulations compared with other South American countries such as Chile and Peru (Galiani et al. 2021). Stringent employment protections have been found to harm both TFP and labor productivity (Bjuggren 2018). Fourth, Argentina is exposed to various natural hazards, such as flooding, heatwaves, drought, and extreme precipitation. With the impact of climate change, by 2050 the frequency of agricultural droughts is expected to increase by 65% and heatwaves will last more than 6247% longer (CMCC 2021). Rising temperatures and the intensification of extreme events (e.g., heatwaves and droughts) cause production variability, with a tendency to reduce yields of many crops, and are associated with an 11.3% increase in agricultural water demand (CMCC 2021). Fifth, other constraints, such as macroeconomic instability and tax inefficiency, long-standing low investment in public infrastructure, and tight agricultural credit, may also result in decreased productivity and TFP growth rates (Galiani et al. 2021). Most of the many factors affecting TFP growth rates in Argentina's agricultural sector are beyond a firms' control, including public funding and private investment, tax and credit policies, and the macroeconomic environment. Effective KMob has been found to impact positively on TFP growth (Sami and El Bedawy 2020). Thus, we assume that KMob barriers impede AFSC KMob, resulting in low agricultural productivity and slow TFP growth rates.

A third key aspect of Argentina's agricultural context is low participation in global value chains (GVCs) across all sectors, including agriculture. Its GVC participation indicator is 0.3, compared with around 0.48 in other developing and developed countries (WTO 2023). The GVC participation indicator is an estimation of how much an economy is connected to GVCs for its production and foreign trade (WTO 2024). It comprises backward and forward GVC participation components to reflect upstream and downstream links in international production chains. The former are measured by the ratio of the foreign value-added content of exports to the economy's total gross exports, and the latter by the ratio of domestic value added sent to third economies to the economy's total gross exports (WTO 2024). Fourth, during harvesting seasons, migrants from Bolivia, Paraguay, and Uruguay seek work on Argentina's farms. As a result, Argentina's AFSCs involve more participants and become more complex, and competition in agricultural markets is intensified (Martin 2016). Fifth, downstream businesses in AFSCs, such as food retailers and restaurants, now have more market power owing to their proximity to end-consumers. This allows them greater access to information on consumer demand and enhances their inventory management and logistics capabilities (Dorsey and Boland 2009). For example, big supermarkets in Argentina, such as Walmart and Carrefour, have more market power and occupy dominating positions in local AFSCs. Finally, farmers and processors (or retailers) have unequal market power, with the former being poorly positioned to negotiate product prices with the latter (Sporleder and Boland 2011). Consequently, farmers form associations and governments enact legislation to strengthen and rebalance these power dynamics. To combat the escalating challenges posed by Argentina's agricultural context, knowledge must be successfully mobilized across AFSC stakeholders. However, various KMob barriers make it difficult to operate AFSCs efficiently and effectively in this uncertain business environment.

2.3 | Middle-Range Theory

To determine an appropriate theory for use in this study, we first examined those previously adopted to explore supply chain KMob. Siemsen et al. (2008) use a motivation-opportunity-ability framework to understand knowledge sharing among employees. Agnihotri et al. (2022) investigate the effective role of social media in facilitating KMob in a business-to-business context based on a KBV, and Frazier (2009) utilizes KBV to examine the interrelationship between physical distribution and channel management. Marques et al. (2020) use a network-of-practice view to explore knowledge diffusion in a global supply network. Grounded in time pressure coping mechanisms, Thomas et al. (2011) develop an understanding of time pressure knowledge sharing in buyer–supplier relationships, while Turkulainen and Swink (2017) explore innovation-related KMob in high-technology environments through the theoretical lens of contingency theory. Other theories widely used to explore supply chain KMob include boundary-spanning theory (Hoegl et al. 2003; Teigland and Wasko 2003), organizational learning theory (Janz and Prasarnphanich 2003; Sabherwal and Becerra-Fernandez 2003), RBV (Paiva et al. 2008; Grawe et al. 2011), social exchange theory (Thomas et al. 2013), social cognitive theory and self-determination theory (Wang 2016), social capital theory (Preston et al. 2017), a team goal orientation approach (Mehta and Mehta 2018), and the knowing-in-practice view (Amaya and Holweg 2024). These general theories have been widely applied to explore a range of supply chain KMob phenomena by defining concepts and relationships at a high level of abstraction (Hunt 1983; Stank et al. 2017). However, they are criticized by scholars for their generality and failure to consider phenomena within a specific functional context (Craighead et al. 2024). For instance, according to the KBV, heterogeneous, inimitable, and valuable knowledge resources are the main sources of firms' long-term sustainable competitive advantage (Grant 1996). Based on this general conception, Agnihotri et al. (2022) posit that supplier account managers' social media use is positively related to their competitor knowledge. Relationships and mechanisms in the SCM and KM domain drive good and bad supply chain KMob outcomes. Contexts are situational opportunities that facilitate or impede particular actions, as opposed to general contexts such as manufacturing or software development companies (Johns 2006), whereas mechanisms are causal processes with the potential to generate outcomes (Pawson and Tilley 1998). Our review of supply chain KMob also reveals that this phenomenon has been explored by scholars at either the individual, group, organizational, or environmental levels (see Table 1). Since supply chains are multi-level systems involving individuals and organizations, both of which are influenced by their external environments, we assume that a good understanding of supply chain KMob can

be obtained only by connecting individuals and organizations within a given environment.

In this study, we focused on AFSC KMob barriers for several reasons. First, KMob barriers are changeable and invisible, residing in different traditions, cultures, societies, thoughts, values, interests, and behaviors. These differences cause KMob barriers (Riege 2005). However, very few studies connect KMob barriers with specific environments, posing challenges to gaining a deeper understanding. Our review of 35 empirical studies of supply chain KMob published between 2003 and 2024 also supports this point, showing that these studies explore KMob issues from a general contextual perspective. Second, AFSCs' continued prosperity truly relies on effective KMob to ensure that research, innovations, and best practices are translated into actionable insights that benefit stakeholders across the entire supply chain. The lack of in-depth investigation of KMob barriers makes it difficult to adapt knowledge to local contexts (Schoenherr et al. 2014). KMob can be viewed as a form of contextual change, as it involves not only sharing information but also transforming how that knowledge is contextualized and applied in different environments (McInerney 2002). Thus, a deeper understanding of AFSC KMob barriers can only be obtained by exploring this issue in specific environments. General theory-driven research questions focusing on phenomena operationalized at high levels of abstraction with little functional context or specificity (Stank et al. 2017) are therefore inapplicable. In contrast, MRT enables a level of specificity that narrows down explanations of causal connections to a subset of phenomena operating within a given context (Pellathy et al. 2018). It is thus suited to this study.

To successfully adopt MRT, we needed to check for three prerequisites for its implementation (Pawson and Tilley 1997). First, the investigated phenomenon must have received considerable scholarly attention, resulting in accumulated knowledge. In this case, supply chain KMob has been explored by scholars from various perspectives, and substantial qualitative and quantitative empirical evidence has been accumulated over time (see Table 1). This would allow us to consolidate relevant knowledge. Second, MRT aims to extend existing findings to generate novel knowledge. Established knowledge of supply chain KMob focuses mainly on understanding this phenomenon from either individual, group, organizational, or environmental perspectives in different general contexts (Grawe et al. 2015; Kull and Ellis 2016; Wang 2016; Donmez and Norheim-Hansen 2024), thereby promoting scholarly understanding of factors influencing supply chain KMob. However, why and how these factors arise and when they influence supply chain KMob remain underexplored, leaving a gap for us to fill. Third, MRT focuses on causal mechanisms and the contexts in which they produce outcomes (Pinder and Moore 1979).

By considering these prerequisites, we developed an MRT framework of AFSC KMob barriers, as illustrated in Figure 1. This begins by seeking a well-defined relationship between X and Y within a specific domain of knowledge central to the study. We focused on supply chain KMob barriers that have received considerable scholarly attention and have been extensively explored. Thus, we established a theoretical proposition by positing that AFSC KMob barriers impede AFSC KMob. MRT differs from other theories in its capability to produce insights into why, how, and when outcomes occur (Astbury and Leeuw 2010). Next, we considered why the investigated phenomenon occurs by actively searching existing studies. More specifically, a mechanism is needed to link antecedents and outcomes. For example, Zhao, Chen, et al. (2023), Zhao, Liu, et al. (2023) analyze factors affecting AFSCs' cross-boundary KMob, and conclude that knowledge boundaries may impact on AFSC KMob performance. Accordingly, we supposed that AFSC KMob barriers impede AFSC KMob through the mechanism of knowledge boundaries. A knowledge boundary is defined as the limit or border of an agent's knowledge base in relation to a different domain of knowledge (Hawkins and Rezazade Mehrizi 2012). To explain how knowledge boundaries are produced, we viewed supply chain KMob as occurring at individual, intra-organizational, and inter-organizational levels because supply chains are formed by individuals and organizations and information is shared across stakeholders. Syntactic, semantic, and pragmatic boundaries may arise from differing individual characteristics, types of knowledge, and practitioners' perceptions and interpretations of knowledge (Carlile 2002). For example, a syntactic boundary arises when people use different vocabularies or languages but share a common logic, values, and worldview. A semantic boundary occurs mainly when people do not share a common logic or values, and have different understandings and interpretations of the same issue or event. A pragmatic boundary results from people having not only different understandings and interpretations but also differing or even conflicting interests (Liu et al. 2019). To further explain this phenomenon and answer "when" question, mechanisms that link antecedents and outcomes and contextual environments that enable or inhibit these mechanisms are described in detail (Stank et al. 2017), particularly in the belief that PESTLC environments may cause the investigated phenomenon. MRT seeks to unpack why and how constructs are related, and under what conditions, which can be guided by the *context + mechanism = outcomes* (CMO) (Pawson and Tilley 1997). Thus, we developed several CMO configurations to represent our findings.

2.4 | Research Gaps

Our Review of Studies Relating to Supply Chain KMob Revealed Two Research Gaps.

First, various theories have been applied to investigate supply chain KMob (see Table 1). These include social capital (Hoegl et al. 2003), resource commitment (Wagner and Buko 2005), demand collaboration (Kahn et al. 2006), organizational learning (Anand et al. 2010; Manuj et al. 2014), the knowledge life cycle model (Chen et al. 2010), co-opetition (Li et al. 2011), and knowledge acquisition (Hora and Klassen 2013). These theories have contributed to understanding supply chain KMob from either individual, team, intra-organizational, inter-organizational, or environmental perspectives. For example, Droge et al. (2003) explore the impact of contextual variables on knowledge creation and application, and Sarin and McDermott (2003) investigate the influence of team leaders' characteristics on team learning. However, very few studies have integrated multiple perspectives to systematically

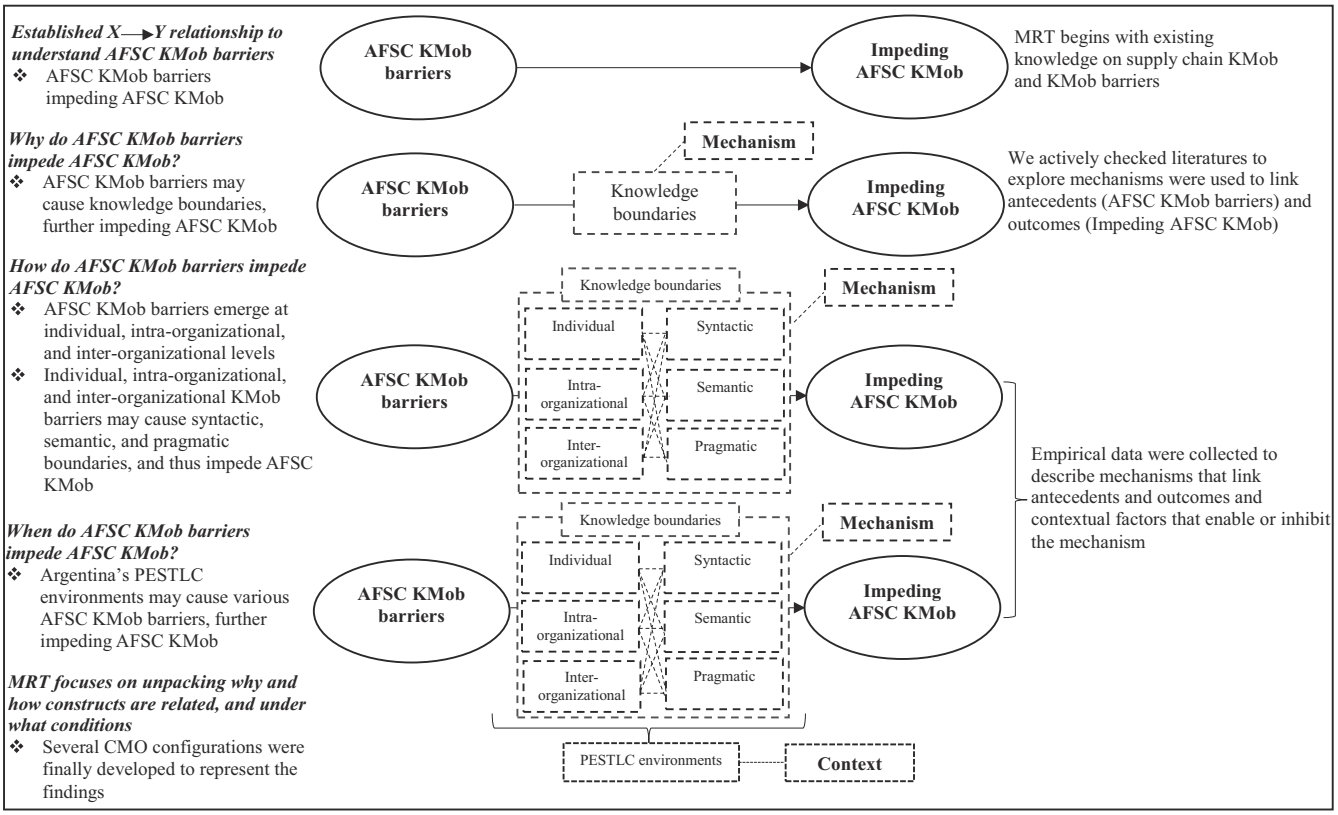

FIGURE 1 | MRT framework of AFSC KMob barriers.

investigate supply chain KMob issues. Of the articles we reviewed, only Wang (2016) explores factors influencing KMob behaviors from the personal and environmental perspectives. To fill this gap, we adopted MRT systematically to investigate causal mechanisms and the contexts in which they impede AFSC KMob. MRT offers an approach to explain and extend knowledge of KMob barriers beyond generalizable correlations between variables.

Second, most studies of supply chain KMob understand this phenomenon from a general environmental perspective, ignoring any effect on particular KMob actions. For example, Schoenherr et al. (2014) explore the impact of tacit and explicit knowledge on supply chain performance in a manufacturing industry, and Bustinza et al. (2010) investigate the effects of knowledge quality on outsourcing benefits in a service-sector context. Nevertheless, our review highlights some studies that investigate environmental impacts on supply chain KMob. For example, Droge et al. (2003) show that firm size does not impact knowledge constructs, whereas high technological turbulence positively influences knowledge creation and application; Manuj et al. (2014) highlight that customers' and third-party logistics providers' contextual conditions may influence interorganizational learning; and Thomas et al. (2013) find that the strength of knowledge transfer activities between buyer and supplier is affected by their level of dependence. Although previous studies have investigated the impact of environmental conditions on supply chain KMob, very few have explored this issue from the perspective of a country's environment. This study fills this research gap.

3 | Research Methodology

In this section, we first describe our study design, including the country setting, sampling strategy, and case selection. We then provide an overview of our empirical data collection process.

Although supply chain KMob has been widely investigated, its complexity, fragmentation, and context-specificity deserve further exploration. Previous studies have explored variables, practices, factors, mechanisms, and relationships influencing supply chain KMob from different perspectives in various contexts. However, none have taken the unique country-specific context into consideration, such as Argentina's PESTLC environments, nor has a holistic approach been taken to explore this issue. For example, grounded in KBV to explore factors affecting KMob from an organizational perspective, Teigland and Wasko (2003) show that co-located worker, intra-organizational electronic network, and external contacts may influence internal and external information sharing. However, they neglect environmental and individual effects on KMob. In investigating KMob in the context of buyer supplier relationships, Thomas et al. (2011) reveal that suppliers' use of time pressure coping mechanisms negatively influences buyers' willingness to share knowledge. However, they consider only organizational mechanisms influencing KMob in a general context, and neglect individual effects. Our extensive review also shows that most existing studies of supply chain KMob focus largely on the effects of different mechanisms, but neglect contextual influences. Our study differs from these previous works in adopting a holistic view to investigate

barriers influencing AFSC KMob, rather than using only a sub-construct of a supply chain. Our unique view resides in understanding that supply chain KMob depends on the collective efforts of individuals and organizations, and both are influenced by external environments. Given the limited extant research on AFSC KMob barriers integrating individual, organizational, supply chain, and environmental levels, an exploratory study was necessary. More specifically, our investigation of AFSC KMob barriers in the context of Argentina's PESTLC environments differs in focusing on general contexts (e.g., general supply chain, manufacturers, and logistics operations) to explore similar issues.

Our novel idea of capturing complex relationships between individuals, organizations, and environments to understand AFSC KMob barriers required us to adopt a more rigorous research methodology to produce deeper insights. Most existing SCM research is based on a nexus of pre-established concepts, connecting these concepts by using management or economic theories to explain any observations of conceptual relationships found in applying data to the situation (Stank et al. 2024). In contrast, our study was guided by inductive, observationally grounded research (Clark et al. 2010). More specifically, we observed an industry to formulate an initial idea, clarified these observations by moving back and forth between relevant existing theories and managerial insights through field research, and used the observations to posit testable propositions for future research and actionable steps for supply chain managers to mitigate problematic issues. Our research methodology is illustrated in Figure 2. We gained interpretive insights by interviewing professionals, checking relevant documents, and conducting on-site observations (Barratt et al. 2011). Our central unit of analysis was individual perceptions of KMob barriers through the theoretical lens of MRT.

To ensure rigorous research, we applied eight criteria around reliability, validity, and trustworthiness widely adopted in previous case study research, as shown in Table 2. The issues raised are discussed further in the next sections on case selection, empirical data collection, and data analysis.

3.1 | Country Setting, Case Selection, and Sampling Strategy

Consistent with using MRT to understand AFSC KMob barriers, we carefully designed a single-case study and selected Argentina as the single context of the study. Yin's (2013) five rationales for single-case designs were adopted to provide a sound justification. The first rationale to be considered in developing a single case is that it is a *critical case* for testing a well-formulated theory. In this study, to understand AFSC KMob barriers we utilized MRT, which is a well-developed theory with specified processes (Pellathy et al. 2018; Malik and Ali 2023). For example, Craighead et al. (2024) formulate a five-step process, including setting the stage for MRT and determining how to engage the theory, to develop a high-quality, middle-range theorization. MRT has also been used to examine mechanisms that produce outcomes in a particular context, which aligns with our research aim to understand AFSC KMob barriers raised by the collective efforts of individuals, organizations, and environments. As a major agricultural

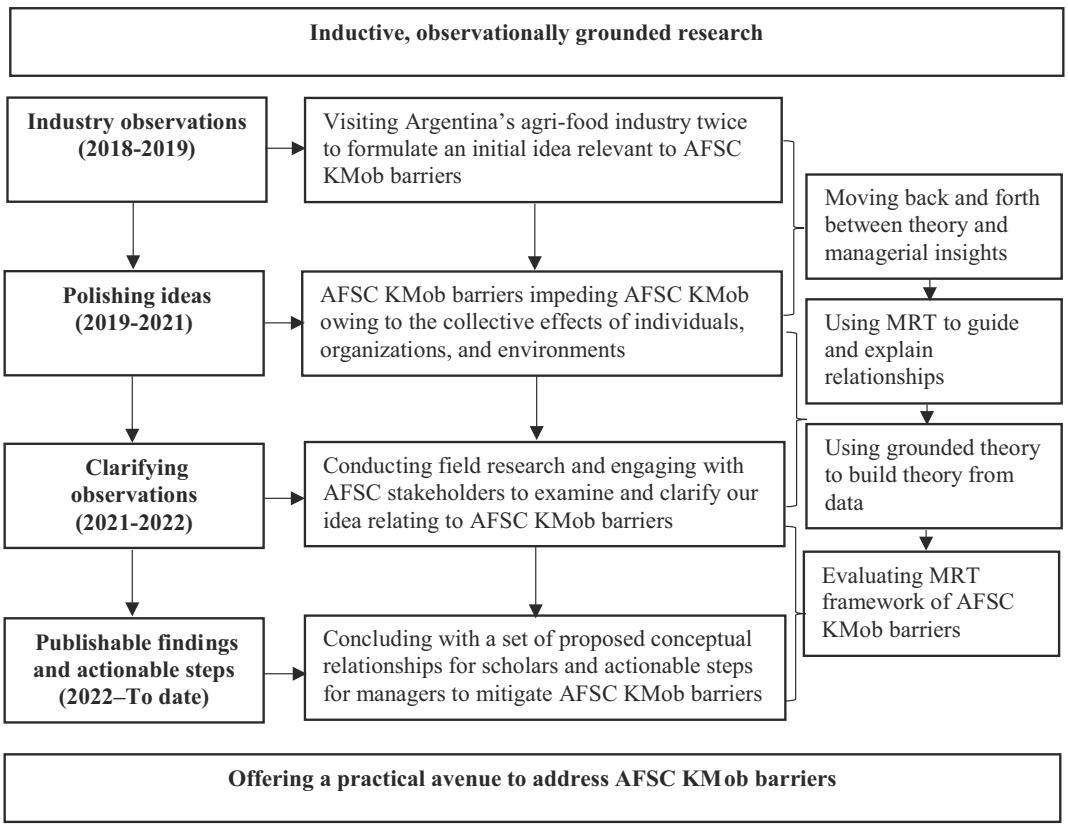

FIGURE 2 | Research methodology adopted.

TABLE 2 | Validity, reliability, and trustworthiness issues addressed in this research.

Reliability/validity/trustworthiness criterion	Measures adopted
Reliability (demonstrating that the same insights can be produced by performing the same operations)	• Development of a case study protocol to clarify the research procedures • Development and use of a case study database (e.g., notes taken, and archival documents collected throughout interviews)
Internal validity (establishing a causal relationship whereby certain conditions are believed to lead to specific results)	• Industry observations between 2018 and 2019 as a foundation for our research • Moving back and forth between the established literature on supply chain KMob and managerial insights to polish our research framework • Data analysis results (AFSC KMob barriers) sent to interviewees for checking
Construct validity (referring to the quality of the conceptualization or operationalization of the relevant concept)	• Interviews fully transcribed, and checked by interviewees • Multiple sources of information collected and used in this study, including interviews with AFSC practitioners, onsite observations, and secondary data • Participant diversity, for example involving participants with varied expertise • Clearly defined KMob barriers aligned with the theoretical framework
External validity (establishing whether and how a case study's findings can be generalized)	• Clear rationale for the case study selection adopting Yin's (2013) five rationales for single-case designs • Inclusion of seven Argentinian agri-food organizations for analysis • Adoption of MRT for theory matching
Credibility (extent to which results appear to be acceptable representations of the data)	• Prolonged engagement, visiting Argentina five times between 2018 and 2022 to understand the contexts • Data collected and analyzed by two researchers • Online workshop conducted to ensure that participants understood relevant concepts • Data triangulation, employing multiple data sources (e.g., interviews, observations, and documents) to cross-verify findings
Transferability (extent to which the findings from one study in one context will apply to other contexts)	• Grounded theory used to guide data collection and data analysis processes • Sample including firms with different roles in the AFSCs • Detailed contextual information provided to enable readers to assess the transferability of findings • Sampling process and criteria clearly articulated
Dependability (extent to which the research process is logical, traceable, and clearly documented)	• More than one participant per organization • Triangulation with governments, as well as documents, policies and websites
Confirmability (extent to which interpretations are the result of the participants and the phenomenon, rather than researcher bias)	• All interviews and documents analyzed by two researchers • Summary of the research findings analyzed by an OSCM professor who acted as controller

Note: Based on Gibbert et al. (2008), and Yin (2013).

power, Argentina meets our requirement to test, challenge, or extend MRT. The second rationale is to consider an *extreme case* or a *unique case* when developing a single-case study. Supply chain KMob is a widely discussed topic and has been explored in many countries, including Brazil, China, Demark, Finland, Germany, Norway, South Korea, Spain, Sweden, Switzerland, UK, and USA (see Table 1), but Argentina has seldom received scholarly attention. Moreover, Argentina's major agricultural products are soybean, corn, wheat, meat, wool, and wine, so most AFSC research has focused on these products (e.g., Arrieta et al. 2022), whereas few scholars have considered the country's vegetable AFSCs, even though its vegetable production is highly ranked globally. Table 3 shows various countries' vegetable production matrices. For comparison, we include all South American countries, along with other countries in which supply chain KMob studies have frequently been conducted (see Table 1). For example, with regard to tomato crop yields, Argentina produces 71.64 tons per unit of land, which is significantly lower than in other developed countries such as Switzerland (198.39 tons), Sweden

TABLE 3 | Various countries' vegetable production matrices.

Country	Crop production index (2022)	Vegetable production (2022) (tons)	Arable land (2021) (acres)	Crop yield—tomato (2022) (tons)	Crop yield—lettuce (2022) (tons)	Crop yield—potato (2022) (tons)
Argentina	107.3	3.9 M	104.3 M	71.64	N/A	35.6
Bolivia	111.7	481.2 K	12 M	16.3	6.51	6.34
Brazil	115.9	8.7 M	143.9 M	69.91	N/A	33.02
Chile	106.4	2 M	3.2 M	73.81	13.9	28.01
China	111.9	616 M	269 M	60	23.52	16.07
Colombia	111.6	2.5 M	4.9 M	50.86	24.1	21.98
Demark	107	227.4 K	5.8 M	379.67	12.74	44.22
Ecuador	100	467.1 K	2.5 M	28.87	7.35	14.03
Finland	98.7	254.9 K	5.5 M	378.56	23.96	28.09
Germany	91.5	3.4 M	28.8 M	268.89	31.02	40.10
Guyana	105.6	220.1 K	1 M	89.45	N/A	N/A
Norway	101.8	186.5 K	2 M	356.89	17.9	31.63
Paraguay	74.8	156.5 K	11.7 M	40.84	N/A	14.67
Peru	130.7	3.1 M	10.6 M	41.16	12	17.63
South Korea	93.6	9.2 M	3.3 M	61.51	25.13	25.32
Spain	87	11.8 M	28.5 M	80.88	28.9	31.33
Suriname	80.2	9.6 K	143.3 K	12.83	N/A	N/A
Sweden	103.1	335.7 K	6.3 M	432.25	15.1	36.4
Switzerland	97.4	403.5 K	977.2 K	198.39	18.46	36.28
UK	94.3	2.3 M	14.9 M	374.49	27.98	37.9
Uruguay	79.7	179.1 K	5 M	76.45	N/A	21.51
USA	93	27.1 M	389.8 M	95.54	32.92	49.09
Venezuela	93.9	1.2 M	6.4 M	21.21	20.35	19.91

Note: (1) Vegetable production comprises mainly annual crops used for food, including root, bulb, and tuberous vegetables (onions, garlic, and beets), but excluding vegetables grown principally for animal feed; (2) the crop yield is the amount of a crop grown per unit of land; (3) the crop production index is agricultural production for each year relative to the base period 2014–2016; (4) data drawn from Our World in Data (Ritchie et al. 2024; World Population Review 2024a, 2024b; World Bank Group 2024a).

(432.25 tons), and Denmark (379.67 tons). Its tomato crop yield is ranked 4th among South American countries, lagging behind Chile, Guyana, and Uruguay. With regard to total vegetable production, Argentina produced 3.9 million tons of vegetables in 2022, ranked 4th among the selected 23 countries. Given the important role of Argentina's vegetable production and its rare investigation, it offers potential to extend scholarly understanding of AFSC KMob barriers and even refocus future supply chain KMob investigations by connecting individuals, organizations, and environments. The third rationale for developing a single case is the *representative* or *typical* case, which reminds us to justify Argentina's unique environments. Most previous supply chain KMob studies have been conducted in developed countries, which have good infrastructures, stable economies, and high per capita income (Home Office. 2021). Scholars may prefer to conduct supply chain KMob studies in developed rather than developing countries because the former have active KMob (e.g., technology sourcing and transfer) and frequent knowledge flows (De Rassenfosse and Seliger 2020). In contrast, Argentina is currently in an economic crisis, with the highest global annual inflation rate of 211.4% in 2023 (Roy 2024). Moreover, its cultural value orientation is characterized by strong hierarchy and embeddedness and weak intellectual autonomy, whereas developed countries such as Germany and Denmark are high in egalitarian and intellectual values, with low hierarchy and embeddedness (Schwartz 2006). These differences in cultural and economic environments may give rise to different supply chain KMob activities. The fourth rationale for a single-case study is the *revelatory* case, which requires observation and analysis of a previously inaccessible phenomenon. We had established strong connections with Argentinian academics and agri-food industry practitioners through our involvement in a 5-year, cross-country collaborative project focusing

on agri-food system uncertainty. This project had enabled five visits to Argentinian agri-food organizations to acquire valuable data. Our work package focused on KMob crossing boundaries. Thus, we visited Argentina's agri-food industry twice in 2018 and 2019 to gain an initial understanding of how knowledge was mobilized across different AFSC stakeholders. We then visited Argentina three times between 2021 and 2022 to engage with AFSC stakeholders and investigate AFSC KMob barriers, focusing on Argentinian agricultural business cases. The final rationale is the *longitudinal* case, studying a single case at two or more different points in time. We visited Argentina five times between 2018 and 2022 and collected data relevant to AFSC KMob barriers across Spring, Summer, and Autumn.

We organized a virtual meeting with our Argentinian colleagues to discuss our project aims, interpret relevant KMob concepts, and explain our research objectives. We expressed our wish to visit several agri-food organizations and interview different levels of management about AFSC KMob barriers. With over 30 years' experience of working with the agri-food industry and wide connections with local agri-food organizations, our Argentinian colleagues helped us to identify suitable organizations. The selection criteria were that they must be mature firms that had been operating for more than 10 years to ensure that they had accumulated KMob-related knowledge, and they must have a KMob department, or at least a specific person responsible for KMob. Accordingly, our Argentinian partners identified seven organizations that fulfilled these criteria and whose management team members were willing to participate in our interviews, including farms, an agricultural department of regional government, an agricultural research institute, a wholesale distribution company, and an agrichemical company. Specifically, our sample included three farms, all with more than 100 ha of farmland, focusing on growing a wide variety of vegetables, such as tomatoes, cucumbers, peppers, eggplants, lettuces, cabbages, and cauliflowers. Tomatoes, cucumbers, peppers, and lettuces are normally grown in greenhouses, whereas cabbages and cauliflowers are cultivated in open fields. These farms employed seasonal and permanent workers (normally 20–50 people), especially during planting and harvesting periods. They used various greenhouse types (e.g., chapel, modified chapel with more height, and metal parabolic), and some technologies (e.g., water and fertilizer integration systems) to support farming processes.

Prior to conducting the empirical data collection, in August 2021 we organized an online workshop entitled "KMob crossing boundaries for AFSCs" to explain relevant concepts to potential interviewees, including KM, KMob, knowledge boundaries, and boundary-crossing mechanisms. We advertised this workshop through our Argentinian partners' networks (e.g., WhatsApp, email, LinkedIn) and invited employees and managers from the seven selected agri-food organizations to attend. At the end of the workshop, we asked the participants whether they would be willing to engage in further interviews relating to AFSC KMob barriers. Sixty-four participants agreed to do so, accounting for 31.3% of initial participants. However, not all volunteers were suitable for further involvement in our research. We purposively sampled them based on three criteria: (1) they should have more than 10 years' working experience in the agri-food industry to ensure high expertise; (2) they should be involved in tackling KMob issues or in relevant KMob activities to ensure sufficient professional knowledge; and (3) they should be middle- or senior-level management team members. Twenty-two participants who had either insufficient working experience or no practical experience relating to KMob were excluded from further interviews, leaving 42 participants who were invited to indicate their availability in the ensuing months, covering the spring, summer and autumn seasons in Argentina. Our selection of specific seasons was based on the seasonality of agriculture and intensive KMob activities involved in cultivation, pest management, harvesting, processing, and wholesaling processes.

3.2 | Empirical Data Collection

We developed an interview guide through a roundtable discussion with two professors in operations and SCM (OSCM; see Appendix 1). Both had been working with the agri-food industry for more than 20 years and had rich experience in designing qualitative interviews. The questions were specifically designed to explore AFSC KMob barriers from the knowledge, individual, intra-organizational, inter-organizational, and environmental perspectives, to help generate a contextually specific understanding of AFSC KMob. We then conducted pilot interviews with three agri-food professionals from Argentina to check the intelligibility of the structure and questions of the interview guide. Accordingly, we avoided using professional words owing to the potential interviewees' low educational levels; we maintained flexibility in asking questions, and Spanish- and English-speaking scholars were involved in the interviews because the official language of Argentina is Spanish. The empirical data collection process is shown in Figure 3.

We visited Buenos Aires three times to conduct the interviews between September 2021 and May 2022. Specifically, we visited the La Plata peri-urban green belt area, which is a high capitalization greenhouse area with more than 6000 farmers producing different types of vegetables (e.g., tomatoes, cucumbers, peppers, lettuces, cabbages, and cauliflowers). Our data collection was carried out over three rounds to cover spring, summer, and autumn seasons in Argentina. An experienced scholar brought up in Spain who had been working for a UK university for more than 10 years and had a special interest in the agri-food industry was involved in all interviews and acted as a translator. In the first round of data collection, from September to October 2021 (spring), we visited two farms and interviewed 12 participants at different levels of management. We deployed adaptable, open-ended, and flexible questioning to elicit unique knowledge from the interviewees. In the second round of data collection, from December 2021 to February 2022 (summer), our 20 interviewees were drawn from an agrichemical company, an agricultural department of regional government, and an agricultural research institute. The final round of data collection between March and April 2022 was conducted with ten interviewees from a farm and a wholesale distribution company. Thus, we conducted a total of 42 interviews with interviewees from seven different agricultural organizations covering various roles in AFSCs. Demographic information on the sample is provided in Table 4. To generate more useful knowledge from the interviews, the interview guide was sent to interviewees 3 days in advance to ensure that

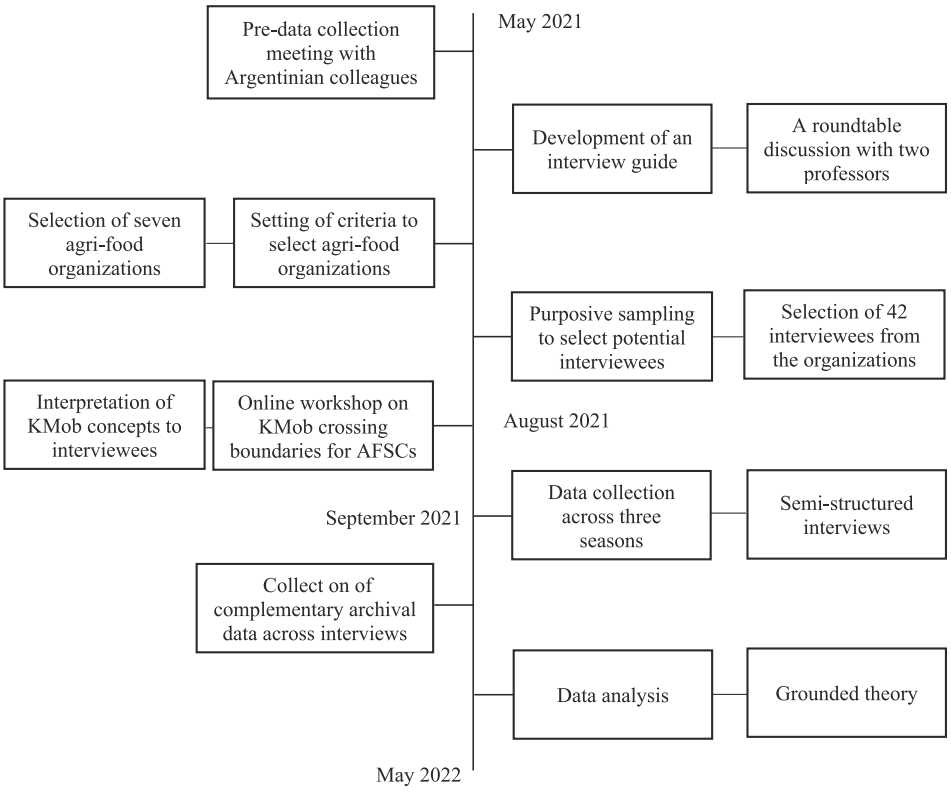

FIGURE 3 | Empirical data collection process.

they had time to familiarize themselves with the questions and organize their answers. Prior to conducting the interviews, we obtained permission to record them. Each interview lasted between 40 and 75 min, resulting in 52 h of digital recording.

Following Yin's (2009) 24-h rule, we carried out rapid data analysis to identify the data saturation point, conducting the analysis concurrently with the data collection to maintain sensitivity to issues relevant to the sampling and the questions posed. This rule is particularly useful in case study research, as reviewing and analyzing the data within 24 h of the data collection event ensures fresh memory, more accurate interpretation of the data, and identification of missing information that should be addressed in follow-up data collection activities. Thorough and timely analysis also contributes to data integrity and identification of the data saturation point. After conducting 38 interviews, we found that some institutions, including INTA and the Central Market of Buenos Aires (the wholesaler involved in this study), and some KMob barriers, such as reluctance to share knowledge, were mentioned frequently by the interviewees. Realizing that the data saturation point might have been reached, we decided to conduct four further interviews to confirm that no new themes emerged. This resulted in a total sample of 42 interviews.

Interviews with middle- and senior-level agri-food professionals helped us to gain a thorough understanding of Argentina's PESTLC environments, the KMob models that each company had adopted, and the KMob barriers encountered. However, connections between the emergence of KMob barriers and Argentina's PESTLC environments remained unclear. For example, several interviewees mentioned that Argentina's export control policy and unstable economic environment, of which we had inadequate understanding, might contribute to AFSC KMob barriers. Even after concluding the interviews, additional data were examined as needed during the data analysis. These insights into AFSC KMob barriers and Argentina's PESTLC environments were complemented by archival data, such as industry reports, government policies, and company websites, all data being compiled in a database. Archival data are useful in helping researchers to identify relationships that they might not have otherwise noticed and gain a deeper understanding of the historical context (Roulston 2019). Our additional information corroborated our interview data and was obtained from government policies relating to the exportation of agri-food products, newspaper articles, and social media posts reporting on agri-food organizations' KMob stories, an agricultural research institute's blogs on funding details, and agri-food industry reports highlighting negative news associated with KMob. Information contained in these documents provided an external perspective on the internally collected information. This combination of primary and secondary data also strengthened the validity of this study. This approach was continued until we had gained a thorough understanding of relationships between the emergence of AFSC KMob barriers and Argentina's PESTLC environments. We initially reviewed the archival data (e.g., industry reports and government policies), and then highlighted and extracted the most relevant aspects relating to Argentina's PESTLC environments to show their influence on AFSC KMob barriers (see Appendix 2).

4 | Data Analysis and Findings

In this section, we present our data analysis processes and interpretation of our results.

TABLE 4 | Interviewee information.

Organization	Role in AFSCs	Interviewee (department and title)	Working experience (years)	Interview date
Agrichemical production company producing and selling agrichemical products to local farmers, with several selling points across La Plata	Input supplier	Company director	28	Dec. 2021 (summer)
		Director of procurement	15	
		Store manager 1	12	
		Store manager 2	14	
Farm 1: more than 24 employees, producing leaf vegetables	Producer	Farm director	30	Sep. 2021 (spring)
		Farm co-director	28	
		Director of quality management	22	
		Director of marketing	20	
		Director of production	15	
		Director of KMob	18	
Farm 2: over 30 employees, producing eggplants, tomatoes, cucumbers, and cauliflowers	Producer	Farm owner	35	Oct. 2021 (spring)
		Director of quality management	18	
		Director of pest management	24	
		Director of marketing department	16	
		Director of financial management	26	
		Director of KMob	12	
Farm 3: third-generation family business producing tomatoes, spinach, potatoes, and other leaf vegetables	Producer	Founder of the farm	30	Mar. 2022 (autumn)
		Co-founder of the farm	28	
		Director of quality management	16	
		Director of marketing	21	
		Director of human resource management	23	
Agricultural research institute with a wide range of activities, including biotechnology and KMob	Research & KMob	Director of the research institute	26	Jan. 2022 (summer)
		Director of KMob	24	
		Director of marketing department	14	
		Director of seed management	18	
		Director of financial management	12	
		Director of technology management	22	
		KMob researcher 1	10	
		KMob researcher 2	10	
Agricultural department of regional government aiming to help cooperatives and farmers by conducting KMob activities and establishing agricultural-related policies	Policymaker	Government officer	15	Feb. 2022 (summer)
		Director of KMob	16	
		Agri-food Minister of Buenos Aires Province	25	
		Employee responsible for good agricultural practice 1	11	
		Employee responsible for good agricultural practice 2	14	
		Director of training management	21	
		Director of licensing management	18	
		Director of public relations	15	

(Continues)

TABLE 4 | (Continued)

Organization	Role in AFSCs	Interviewee (department and title)	Working experience (years)	Interview date
Central Market of Buenos Aires: an important sales location for producers of tomatoes, eggplants, apples, peaches, oranges, and lemons	Wholesaler	Director of marketing	14	April. 2022 (autumn)
		Director of pesticide residue testing	25	
		Director of operations management	26	
		Director of inventory management	20	
		Director of technology & KM	22	

4.1 | Data Analysis Procedure

We analyzed the data inductively following an iterative process. The coding and data analysis process for concept development and theory articulation was based on Gioia et al.'s (2012) guidance. We first prepared our data for analysis by transcribing the interview audio files and editing the transcripts. For example, we gained familiarity with the digital recordings by carefully listening to them several times, followed by verbatim transcription to avoid missing any important terms. We then immersively read the transcripts repeatedly to increase our familiarity with the data and remove irrelevant data before conducting open coding. Thus, the 52 h of digital recordings produced nearly 168 pages of transcripts. In preparing the data for further analysis, we also identified several contradictory statements by different interviewees. These issues were initially encountered during the data collection process and mitigated by triangulating with archival information or interviewing additional practitioners to acquire further insights into the issue. This was why we conducted interviews with participants from different functions of a company and involved participants from governments and agricultural research institutions, which enabled us to gain a more comprehensive understanding of AFSC KMob barriers and their associated environments.

At the open coding stage, the objective was to understand different types of AFSC KMob barriers and the contextual conditions that might cause them. In doing so, we paid particular attention to barriers impeding AFSC KMob and the contextual conditions described by our participants. For example, we coded contextual conditions relating to political and economic changes and their impacts on Argentina's agri-food system. The same two researchers involved in the data collection activities in Argentina were also involved in the open coding process because of their expertise and predominance during the interviews. A coding framework was developed and shared between them to reach a consensus on interpretation. At this stage, we encouraged the researchers to code as many sentences and paragraphs as possible relevant to KMob barriers and the situated contextual conditions. This process was supported by qualitative data analysis software, *NVivo 13*, which facilitated retrieval and management of the data. We also checked intercoder reliability to improve the transparency and trustworthiness of the analysis. Discussions between coders clarified how and why interpretations conflicted. This resulted in an intercoder reliability of 0.76, indicating substantial agreement between coders (Landis and Koch 1977).

At the axial coding stage, the objective was to capture analytical themes, which led to the identification of AFSC KMob barriers and understanding of Argentina's environments. The codes derived from the open coding were refined, aligned and categorized to identify emergent themes. At this stage, we actively compared the codes derived from our data with theoretical concepts derived from the literature to consolidate them into second-order themes. For example, we identified the practices of "occasionally sharing information" and "commercial secrets" as evidence of reluctance to share knowledge. With regard to contextual information, "a change in the macro economy" and "huge exchange rates between US dollars and Argentinian pesos" were evidence of economic instability.

At the selective coding stage, we selected and integrated themes derived from the axial coding into aggregate dimensions to elaborate or formulate the story of the case. We present our findings using first-order codes, second-order themes, and aggregate dimensions (King and Horrocks 2010).

4.2 | Findings

This section describes barriers impeding AFSC KMob within Argentina's PESTLC environments, thereby answering our three research questions. Our findings are organized in the following subsections based on the "what", "why" and "how", and "when" research questions described in our introductory section.

4.2.1 | What Are the Barriers to KMob in AFSCs

From this study, we identify three categories of AFSC KMob barriers, namely individual, intra-organizational, and inter-organizational (see Table 5). Previous studies have also classified KMob barriers. For example, Riege (2005) categorizes KMob barriers into the three categories of individual, organizational, and technological. Among these, individual barriers originate from individual KMob behavior or people's KMob perceptions and actions, organizational barriers relate to the organizational context or strategy, and technological barriers originate from the assumption that frictional interactions between people and technology impede KMob. Patil and Kant (2014) develop five categories of supply chain KMob barriers: strategic, organizational, technological, cultural, and individual. For example, strategic barriers relate to organizational strategies that may affect KMob. Bloice and Burnett's (2016) typology categorizes KMob barriers into individual, organizational, technological, and other. These other barriers include external pressures and governmental interference. We presume that their "other" category was included

TABLE 5 | AFSC KMob barriers identified from empirical studies.

First-order codes	Second-order themes	Definition (or own explanation)	Aggregate dimensions
• "There should be more communications, but this is not happening." • "To be honest, many farmers do not care about sharing knowledge." • "Sometimes, we may share some knowledge, but we are reluctant to share things among farmers' associations."	Reluctance to share knowledge	Refers to individuals' unwillingness or hesitation to share information, insights, skills, or expertise with others (Riege 2005)	Individual KMob barriers
• "We do not have infrastructures that can be used to support knowledge sharing." • "Mainly through face-to-face workshops to share knowledge with AFSC practitioners." • "We give some speech sessions, information sheets to explain how to work, pictures directly shown in the field."	Lack of technology adoption to promote KMob	Refers to situations where organizations or individuals fail to use available digital tools and platforms effectively to share knowledge (Hendriks 1999)	Intra-organizational KMob barriers
• "In this area, most farms are family businesses." • "I am sharing knowledge with my employees through working with them." • "We are reluctant to share knowledge within farmers' associations...but we share a lot with our family members."	Farming as a family business limits KMob across organizational boundaries	Family businesses often keep knowledge within the family, and may lack formal processes for collaborating with external partners (own explanation)	
• "We only have training sessions for new products, for example new agricultural products. We do not have regular training sessions." • "There is no training session in our farm." • "Our training courses are mainly through workshops for small producers."	Lack of practical training and education	Refers to the absence or insufficiency of hands-on, real-world experience in the agricultural field (own explanation)	
• "The number of skills of people working in this area is lowering as time passes, less skilful people." • "Another risk is lack of skilled people." • "It is difficult to find skilled people...We provide rewards to keep them with us."	Lack of skilled personnel	Refers to a shortage of workers with the necessary expertise, qualifications or experience to perform agricultural tasks (own explanation)	
• "The reason why we lack knowledge sharing among partners is because we do not have a strategy and goal for agriculture in this region." • "It is difficult to share knowledge from producers to consumers because of long supply chains and more middlemen." • "We do not have a database on agri-food products (e.g., how much a day produced and consumed), just an estimation. It is difficult for us to provide guidance for farmers."	Lack of shared endeavor among AFSC practitioners	Refers to lack of a common objective for supply chain members to achieve (own explanation)	Inter-organizational KMob barriers
• "We want to promote product quality by using technologies, but there is no difference for consumers." • "Now, the people working in the shops just want to get some income; they may not be knowledgeable and do not have motivation to share knowledge with consumers." • "We may use organic certificates and traceability technology to make our products differ from others. However, all products look the same for consumers."	Knowledge asymmetry between farmers and consumers	Refers to situations where one party has more or better information than another in a given context (Sharma 1997)	

(Continues)

TABLE 5 | (Continued)

First-order codes	Second-order themes	Definition (or own explanation)	Aggregate dimensions
• "Various AFSC actors like to criticize each other...such as you are not on the ground and do not understand the real problem." • "Some research institutes rely on governments to run. Farmers do not trust their governments." • "Farmers feeling that researchers were imposing knowledge, rather than sharing knowledge."	Lack of trust between farmers, researchers and knowledge brokers	Refers to farmers, researchers and knowledge brokers doubting the reliability of another person, group, or system (own explanation)	
• "We belong to an association and have frequent discussions, but not about knowledge exchange." • "This type of association is more like a get-together, social together, not really about knowledge sharing." • "We do not like to share knowledge with other association members because of business secrets."	Farmers' associations are not for KMob	Refers to farmers' associations being used mainly for other purposes, such as social, rather than for knowledge sharing or exchange (own explanation)	
• "There is a lack of private knowledge brokers to facilitate knowledge sharing in general." • "We have some collaborations with INTA, a non-profit organization." • "For the last 30 years, I have been working with INTA to develop a lot of projects on my farms (e.g., biological control)."	Lack of private knowledge brokers	Refers to knowledge exchange activities between different parties being undertaken by governments rather than businesses or organizations owned by individuals or groups (own explanation)	
• "Big supermarkets such as Walmart and Carrefour should put more pressure on farmers to ensure product quality. However, they do not do it." • "There are regulations on agrichemical product use on farms. However, there is no control of agrichemical use." • "The distributors should be better at making sure the fruit and vegetables are good quality, such as ensuring that producers do not use these kinds of agrichemical products. Finally, they will change the situation."	Focal company lacks motivation to facilitate KMob	Refers to the central organization with power to coordinate and control the supply chain, lacking motivation to facilitate KMob (own explanation)	

because the research context was social care, where governmental influences are important. Finally, based on a review of KMob papers published between 2010 and 2017, Anwar et al. (2019) propose five categories of KMob barriers: individual, technological, organizational, cultural, and geographical. Our findings show that existing typologies of KMob barriers are inconsistent and vary across research contexts. However, individual, organizational, and technological categories are widely adopted. Our categorization aligns with previous findings to some degree but also elicits a notable distinction for several reasons. First, we focus on supply chain KMob, which is a multi-level activity, leading to our development of the three categories of individual, intra-organizational, and inter-organizational KMob barriers. Individual KMob barriers relate to people's KMob behaviors or perceptions, intra-organizational KMob barriers originate from organizational KMob strategies or practices that may impede KMob, and inter-organizational KMob barriers relate to supply chain KMob strategies and practices. Second, we did not consider technological barriers because technologies are seldom used to facilitate KMob in the agricultural context of Argentina. Third, we excluded cultural and other environmental barriers because these are beyond the control of a company or even a supply chain. They are more likely to be the contextual conditions that influence people's KMob behaviors or perceptions and organizational and supply chain KMob strategies, thereby giving rise to KMob barriers. Our three categories of individual-, intra-organizational-, and inter-organizational KMob barriers are shown in Table 5.

With regard to individual KMob barriers, we find that reluctance to share knowledge existed widely among agri-food companies in this study. For example, one interviewee stated: "To be honest, many farmers do not care about knowledge sharing." Another held the same view: "Sometimes we may share some knowledge, but in general we are reluctant to share knowledge." Owing to competitive relationships, Argentinian farmers do not like to share knowledge, even if they belong to the same farmers' associations: "We are reluctant to share knowledge or only occasionally to share knowledge."

Our findings reveal four common intra-organizational KMob barriers in Argentina's AFSCs: lack of technology adoption to

promote KMob, farming as a family business limiting KMob across organizational boundaries, lack of practical training and education, and lack of skilled personnel. For example, one interviewee stated: "We are introducing good agricultural practices to farmers in this area mainly through workshops." Widely referenced technologies (e.g., knowledge management systems, collaborative platforms, and learning management systems) available to promote KMob, are not used in Argentina's agri-food companies. Argentinian AFSC practitioners mainly use social media platforms to promote KMob: "We mainly use Facebook, WhatsApp and telephone to share knowledge." This was evidenced by an interviewee from the Central Market of Buenos Aires: "We do not have a database to understand who is producing what, only based on estimation." Approximately 75% of farms in Argentina are family-owned (FAO 2024; World Bank Group 2024b; see Appendix 2), as confirmed by our interviewees: "In this region, most producers are family-owned. For example, we are a third-generation family agricultural business." This structure elicits KMob between family members, whereas inter-organizational KMob is seldom observed.

Finally, we identify six inter-organizational KMob barriers: lack of shared endeavor among AFSC practitioners, knowledge asymmetry between farmers and consumers, lack of trust between farmers, researchers, and knowledge brokers, farmers' associations not being for KMob, lack of private knowledge brokers, and focal companies lacking motivation to facilitate KMob. For example, migrants from other South American countries, including Bolivia, Paraguay, and Uruguay, who are willing to work in Argentina's agri-food industry, have formed associations such as the Bolivian Farmers' Association and the Uruguayan Farmers' Association. However, these are designed for social rather than KMob purposes: "This type of association is more likely for social get-togethers, not really about knowledge sharing." Moreover, lack of trust is indeed a widespread issue affecting inter-organizational KMob. For example, one interviewee stated: "Farmers feel that researchers impose knowledge. Researchers blame knowledge brokers for not being able to share knowledge, and knowledge brokers criticize researchers for being very theoretical and divorced from reality." Focal companies of local AFSCs such as Walmart, Carrefour, and the Central Market of Buenos Aires, which play a pivotal role in managing, coordinating, and influencing the AFSCs' activities, are expected to promote KMob and disseminate good agricultural practices, but fail to do so. For example, one interviewee stated: "Distributors (Walmart, Carrefour and Central Market of Buenos Aires) should put more pressure on suppliers to meet the legal requirements, such as not selling agrichemical products without certificates and knowledge, and using good agricultural practices to produce vegetables. However, they are not doing it." An interviewee from the Central Market of Buenos Aires identified the problem that producers can still sell their products in other markets: "If the producer has something wrong, there is a possibility for producers to send their products to other markets. We need to report this issue to the National Food Safety and Quality Service (SENASA), which should check the farm. However, the inspection system in this country is not strict." Knowledge asymmetry between farmers and consumers may hinder farmers' incentives to adopt innovative technologies or practices, and the situation is even worse when farmers possess more detailed knowledge of product quality. For example, some farms have tried to obtain knowledge and adopt innovative practices to differentiate their tomatoes from others, but have failed to sell to consumers: "We tried to differentiate our products with features like traceability technology and organic. However, consumers still perceive our products as similar to others."

4.2.2 | When Do These AFSC KMob Barriers Emerge and Impede AFSC KMob

We identify 11 barriers that may impede AFSC KMob, categorized as individual, intra-organizational, or inter-organizational. Unlike existing studies of KMob barriers, our study advances the field by examining these barriers in the unique context of Argentina. We discuss Argentina's PESTLC environments and their impacts on the emergence of KMob barriers. First, Argentina's cultural value orientation features strong hierarchy and embeddedness, and weak intellectual autonomy (Schwartz 2006). People in this cultural environment may be characterize by: (1) unconditional respect for parents and religion, and strong opposition to behavior that threatens traditional family; (2) rejection of new realities and unconventional behaviors; (3) fear of exposure to values, beliefs, norms, practices, and traditions that differ from their own; (4) low willingness to accept immigrants and foreign workers; and (5) less willingness to join voluntary organizations. This theoretical knowledge is supported by our empirical data. For example, regarding rejection of new realities, one interviewee stated: "Here we tried KMob to make a difference in our tomato products (e.g., labelling or packaging), but consumers chose normal-looking tomatoes." Another interviewee provided a vivid example: "Some supermarkets imported tomatoes from Europe and sold them in local markets, but they could not sell. The case told us that making differences means failing." Argentina's hierarchical environment also discourages employees from openly sharing knowledge with peers. For example, one interviewee highlighted: "The hierarchical KMob model makes different actors criticize each other. In particular, farmers always feel researchers imposing knowledge on them." Thus, we propose that:

> Argentina's cultural environment, characterized by strong hierarchy and embeddedness and weak intellectual autonomy, may have negative effects on AFSC practitioners' KMob behaviors and perceptions and make them reluctant to share knowledge.

Second, Argentina's legal environment poses challenges for AFSC KMob. For example, Argentina has applied percentage-based export taxes on a range of agricultural products since 2008. According to a recent report, export tax on tomato, lettuce, and other vegetables remains at 5% (USDA 2020). This reduces farmers' willingness to export their products to other countries. This situation was confirmed by the marketing director of the Central Market of Buenos Aires: "What we produced was mainly for the Argentinian market. In the last 32 years, we only exported products five times." The imposed vegetable export taxes contribute to frequent imbalances between offer and demand and strengthen competitive relationships between farmers. One interviewee stated: "A big problem in Argentina's agricultural market is the imbalance in offer and demand.

Sometimes we produced a lot of vegetables, but we were not able to sell them." This is exacerbated by lax inspections of vegetable quality and safety. For example, big supermarkets (e.g., Walmart and Carrefour) are supposed to implement specified quality and safety requirements, and the Central Market of Buenos Aires should not allow non-unqualifying products be sold in other markets. One interviewee stated: "All farmers are expected to use certified agrichemical products. However, some of them do not use them, or use little, owing to non-strict control systems." Thus, we propose that:

> Argentina's legal environment, characterized by lax inspections of vegetable quality and safety and imposed vegetable export taxes, strengthens the imbalance between offer and demand and competitive relationships between farmers, posing challenges for inter-organizational KMob.

Third, Argentina's long standing unstable economic and political environments also pose challenges for AFSC KMob. For example, Argentina has a long history of political dysfunction, which impacts negatively on the agri-food production system. One interviewee stated: "There was a change in the macro economy in 1989 because of political changes in the country. Changes also happened in the private sector, which had an effect on the components of AFSCs." Political instability in Argentina has resulted in financial crises for decades, limiting the resources available to expand knowledge networks (Roy 2024). When exchange rates were more favorable, Argentinians used to be able to buy agricultural technologies from abroad. One interviewee stated: "There was a fixed exchange rate 15 or 20 years ago, when one peso equalled one US dollar. At that time, the government bought agricultural technology from abroad and generated positive effects on the production system. Now, one US dollar equals 360 Argentine pesos." Argentina's exchange rate imbalances significantly affect agricultural technology adoption. Agricultural technologies have now become extremely expensive when purchased in US dollars and converted into Argentinian pesos. Therefore, AFSC practitioners face substantial barriers to adopting modern agricultural technologies. To make matters worse, both public-sector (e.g., INTA) and private sector financial resources to support KMob and agricultural technology development have declined significant. For example, between 2015 and 2020, average R&D expenditure per full-time agricultural researcher in Argentina was 0.1, significantly less than in other South American countries such as Brazil (0.43), Peru (0.42), Bolivia (0.26), Columbia (0.25), Uruguay (0.23) and Mexico (0.18) (Nin-Pratt et al. 2023). Thus, we propose that:

> Argentina's longstanding unstable political and economic environments raise significant barriers for AFSC practitioners to adopt advanced technologies, posing challenges for intra- and inter-organizational KMob.

Finally, Argentina's social environment also impedes AFSC KMob. For example, agricultural workers in Argentina are an aging workforce, and age has a negative effect on KMob behavior (Burmeister et al. 2018). According to Heide-Ottosen (2014), Argentina has a significantly higher proportion of older farmers than other countries in the region. For example, approximately 50% of agricultural landholders are over the age of 55, compared with only 16.1% in Nicaragua and 15.6% in Peru. Moreover, more than 75% of Argentina's farms are family-run, and these account for 18% of the country's agricultural land and produce 27% of total agricultural output (FAO 2024). This frequently elicits KMob at the intra-organizational level, whereas inter-organizational KMob is seldom observed. Argentinians exhibit low willingness to accept immigrants and foreign workers, who therefore tend not to own farmland. For example, informal land contracts reduce people's willingness to accept and apply new knowledge: "In this area, around 2,000 producers from Bolivia do not own the land. Therefore, they are unwilling to share knowledge and apply good agricultural practices." We also observed a bandwagon effect from the government's loose inspection system. For example, one interviewee stated: "We use certified agrichemical products, but this is not for all vegetables. If we use certified agrichemical products on all the vegetables that we produce, this will significantly increase our costs. Not all farmers are using certified agrichemicals." The bandwagon effect impacts negatively on adoption of good agricultural practices, and thwarts AFSC KMob. Based on the above analysis of Argentina's PESTLC environments and their impacts on AFSC KMob, we propose that:

> Argentina's PESTLC environments impact negatively on AFSC KMob, resulting in the emergence of individual, intra-organizational and inter-organizational KMob barriers.

4.2.3 | Why and How Do These AFSC KMob Barriers Emerge and Impede AFSC KMob

To further explain why and how these AFSC KMob barriers impede AFSC KMob, we shared our KMob barrier analysis results with interviewees via email and asked them to connect these barriers with three knowledge boundaries: syntactic, semantic, and pragmatic. This provides a powerful framework for understanding why and how KMob barriers impede KMob in Argentina's PESTLC environments. Our interviewees had a good understanding of knowledge boundaries because we had conducted an online workshop focusing specifically on KMob crossing boundaries for AFSCs. Knowledge boundary types, KMob stages, and boundary-crossing mechanisms were illustrated with practical examples. Our findings show that the 11 KMob barriers elicit two types of knowledge boundaries, semantic and pragmatic, for several reasons. First, in our empirical study in Argentina, our interviewees were experienced AFSC practitioners using the same language and sharing a common logic, values, and world views, so no syntactic boundary (lack of a common lexicon) existed. Second, in Argentina's PESTLC environments, reluctance to share knowledge, lack of shared endeavor among AFSC practitioners, farmers' associations not being for KMob, focal companies lacking motivation to share knowledge, and other inter-organizational KMob barriers contribute to the formulation of a pragmatic boundary (lack of common interests). Third, at the organizational level, lack of skilled personnel may hinder effective communication, further

complicating cross-functional KMob. Even in family-owned farms, people may have different understandings of the same agricultural events/issues (e.g., pest management, agrichemical products, and labor taxes), giving rise to a semantic boundary (lack of common meaning). This is why farmers collaborate with non-profit agricultural organizations such as INTA and SENASA to obtain technical knowledge and support. As shown in Figure 4, Argentina's PESTLC environments foster various types of AFSC KMob barriers, and the latter elicit semantic and pragmatic boundaries, ultimately impeding AFSC KMob. Thus, we propose that:

> In Argentina's PESTLC environments, AFSC KMob barriers may elicit two types of knowledge boundaries: semantic (lack of common meaning) and pragmatic (lack of common interest), thereby impeding AFSC KMob.

5 | Discussion and Contributions

Previous studies of supply chain KMob barriers have focused mainly on identifying KMob barriers in different contexts, linking them with other perspectives on SCM, or using quantitative measures to analyze them. Less understood is how and why KMob emerges and impedes KMob. In this section, we compare our findings with those of previous studies and summarize our theoretical and managerial contributions.

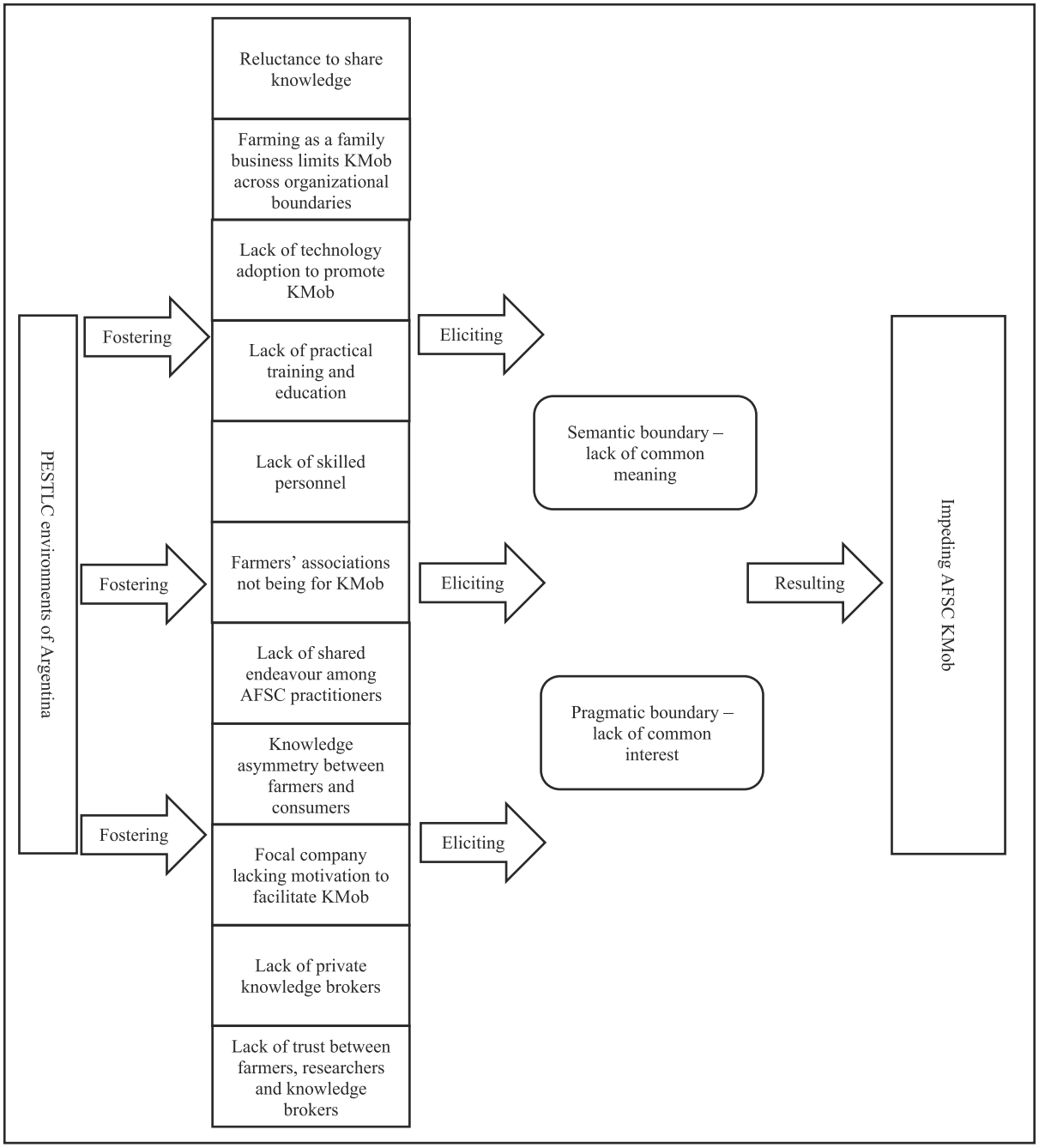

FIGURE 4 | AFSC KMob barriers impeding AFSC KMob in Argentina.

5.1 | Theoretical Contributions

Our investigation of Argentina's AFSC KMob barriers culminates in the model illustrated in Figure 5. This framework captures a country's PESTLC environments, different types of KMob barriers, and knowledge boundaries. It highlights the important role of PESTLC environments in fostering KMob barriers and eliciting knowledge boundaries. This finding differs from those of previous works, representing a novelty of this study. For example, Kivrak et al. (2014) propose that national cultural differences cause language and communication difficulties and trust issues, and that these barriers significantly influence successful KMob in international construction projects. Our study differs in establishing that a country's cultural environment may make people reluctant to share knowledge, thus thwarting KMob. Existing studies investigate supply chain KMob from a national environment perspective, considering mainly national culture (collectivism/individualism) and legal and technological environments (Droge et al. 2003; Michailova and Hutchings 2006; Goswami et al. 2021). Our research extends previous findings on the emergence of different types of KMob barriers originating from a country's PESTLC environments.

Previous scholars have integrated MRT to explore various SCM issues, such as supply chain resilience (Malik and Ali 2023; Zhao, Vazquez-Noguerol, et al. 2024), logistics customer service (Pellathy et al. 2018), and reverse supply chain operations (Russo et al. 2021). In our study, we take an initial step in illustrating how MRT can be integrated to shed light on supply chain KMob and explaining how PESTLC environments affect KMob barriers' emergence and impede AFSC KMob.

5.2 | Managerial Implications

Our study has managerial implications for big supermarkets and agricultural research institutions in Argentina.

First, more than 75% of farms in Argentina are family-owned businesses (FAO 2024; World Bank Group 2024b), and Argentinians prefer to share knowledge with those who share similar values. This results in frequent intra-organizational KMob but limited inter-organizational KMob. Thus, the roles of knowledge brokers (individuals with membership of two organizations) and marginal people (those with membership of multiple organizations) are critical, particularly for those affiliated with non-profit or non-governmental agricultural organizations. We focus on knowledge brokers and marginal people in these two types of organizations because more than 80% of Argentinian farms are small farms, Argentinian AFSC practitioners do not trust their governments, and these organizations have resources and expertise to conduct chain-wide KMob activities. To enhance AFSC KMob performance, we make the following recommendations. Non-profit and non-governmental agricultural research organizations should choose individuals with both expert professional knowledge and practical agricultural skills and train them with strong communication skills. They should organize regular workshops or focus groups led by these knowledge brokers (marginal people) to allow open communication and exchange of agricultural ideas. Customized insights and knowledge should be developed to satisfy different AFSC practitioners' needs. Finally, these organizations should develop a shared knowledge repository of good agricultural practices and research insights to satisfy more AFSC practitioners' needs.

Second, focal companies' roles in AFSC KMob must be strengthened. This applies to big supermarkets such as Walmart and Carrefour, and the Central Market of Buenos Aires. Our interviewees criticized these organizations' failure to take actions to monitor the quality and safety of agri-food products. For example, even agricultural products with high pesticide residues can be sold in the supermarkets. As one interviewee stated: "If these big supermarkets put more pressure on farmers, they will change the situation." To facilitate KMob, focal companies such as Walmart, Carrefour, and the Central Market of Buenos Aires should ask their suppliers (farmers) to use certified agrichemicals, check the quality and safety of vegetables by testing samples in professional laboratories, keep records of and actively report problematic producers to SENASA, and prohibit problematic producers from selling their products in these supermarkets and in secondary markets. SENASA is an independent agency of the Argentinian government charged with surveillance, regulation, and certification of products of animal and plant origin, and prevention, eradication, and control of diseases and pests that affect them (Senasa 2024). Adopting these measures would prevent problematic farmers from selling their vegetables in any markets, which would force them to improve their products' quality and safety through intensive KMob.

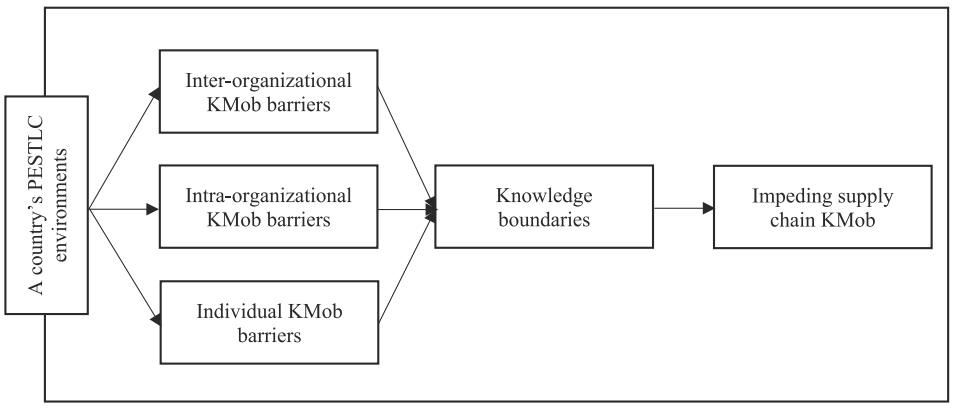

FIGURE 5 | Extracted theoretical framework.

6 | Conclusions, Limitations, and Future Research Directions

As Hall (2001, 19) highlights, "knowledge creates knowledge only when it is successfully mobilized". However, common barriers hamper smooth mobilization of knowledge, motivating us to explore this issue. In this study we applied MRT to understand Argentina's AFSC KMob barriers. Our key findings differ from those of previous studies in highlighting that AFSC KMob barriers are a multi-level and multi-faceted phenomenon, determined by interactions between environments, organizations, and individuals. Thus, we make several contributions to the existing body of knowledge while answering our three research questions.

First, we identify 11 KMob barriers common in Argentina's AFSCs and categorize them as individual, intra-organizational, or inter-organizational. Second, we present a framework for understanding AFSC KMob barriers in Argentina's unique environments, as we propose that AFSC KMob barriers do not occur in a vacuum and their emergence results from Argentina's PESTLC environments. For example, Argentina's cultural environment, characterized by strong hierarchy and embeddedness and weak intellectual autonomy, makes Argentinian AFSC practitioners reluctant to share knowledge. Argentina's unstable political and economic environments pose challenges for intra- and inter-organizational KMob. Thus, unlike most previous studies, ours facilitates a deep understanding of AFSC KMob barriers from a national environmental perspective. Third, we link the identified AFSC KMob barriers with knowledge boundaries, which helps to explain why and how AFSC KMob barriers impede AFSC KMob. Fourth, our utilization of MRT yields rich, actionable insights to AFSC KMob barriers in the contexts of Argentina's PESTLC environments, thereby answering the call to use MRT to advance SCM research (Craighead et al. 2024), the potential of which has been underexploited.

6.1 | Limitations and Future Research Directions

Despite adopting a rigorous research methodology, like many other studies, ours has limitations.

First, our adoption of MRT raises a generalizability issue (Craighead et al. 2024) as our data collection activities were conducted only in Argentina. Future research should thus explore our 11 identified AFSC KMob barriers in the PESTLC environments of other countries and determine their impacts on these barriers. For example, Schwartz (2006) identifies seven cultural value orientations globally: harmony, egalitarianism, intellectual autonomy, affective autonomy, embeddedness, mastery, and hierarchy. West European countries such as Italy, Finland, and Spain are characterized by strong egalitarianism and intellectual autonomy and weak hierarchy; Latin American countries such as Argentina, Brazil, and Chile are characterized by strong hierarchy and embeddedness and weak intellectual autonomy; and South Asian countries including China and Thailand are characterized by strong hierarchy. Differences in countries' cultural value orientations may have diverse impacts on individuals' knowledge behaviors and perceptions. For example, in countries with high intellectual autonomy, individuals may be curious about knowledge and more likely to join voluntary organizations to share knowledge (Schwartz 2006). Countries with different cultural value orientations may also have differing political, economic, social, technological, and legal environments. Thus, we suggest a need for future empirical studies in multiple countries with similar or dissimilar PESTLC environments to Argentina to generate further insights into the impact of PESTLC environments on AFSC KMob barriers.

Second, we conducted interviews with a range of interviewees from diverse backgrounds, including farms, an agricultural department of regional government, an agricultural research institute, an agrichemical company, and a wholesale distribution company of the Central Market of Buenos Aires. However, apart from the AFSC organizations from which we collected data, we did not conduct interviews with practitioners from other types of AFSC organizations, such as processing, distributing, and retailing organizations, which are also stakeholders in AFSCs' KMob. Interviews with participants from these organizations might contribute a more comprehensive understanding of how KMob barriers impede AFSC KMob in Argentina's PESTLC environments. Therefore, we suggest future research should encompass practitioners from agri-food processing, distributing, and retailing organizations.

Conflicts of Interest

The authors declare no conflicts of interest.

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Appendix 1

Interview Guide

In this study we aim to understand supply chain KMob barriers by linking environments, organizations, and individuals. KMob barriers are factors that may impede KMob.

Section 1: Introductory Questions to Understand the Company's and the Interviewee's Background

A. Interviewee background information
   1. What is your current designation?
   2. Can you give me a brief overview of your job within the company's operations?
   3. How many years have you been working in this company?
   4. How many of your years' working experience have been in relevant areas?

B. Company background information
   1. Can you give me a brief overview of the company's structure and operations?

Section 2: Supply Chain KMob Barriers

A. Environments contributing to supply chain KMob barriers
   1. Can you give me a brief overview of the technological, social, economic, legal, cultural, and political environments of Argentina?
   2. How would you think the economic environment may impact on KMob?
   3. How would you think the political environment may impact on KMob?
   4. How would you think the social environment may impact on KMob?
   5. How would you think technology adoption may impact on KMob?
   6. How would you think any policies may impact on KMob?
   7. How would you think any cultural factors may impact on KMob, such as whether you are willing to share knowledge?

B. Organizations contributing to supply chain KMob barriers
   1. Can you describe any KMob barriers inside your organization?
   2. Can you describe any KMob barriers in supply chain networks?

C. Individuals contributing to supply chain KMob barriers
   1. Do you think any KMob barriers are relevant to personal characteristics?

Appendix 2

Examples of Archival Data

Quotes from documents/websites	Representative documents/websites (sources)	Theme
"Argentina has 334,000 farms, of which 251,000 or three quarters are family-owned." "Seventy-five percent of Argentina's farms are family farms. They account for 18% of the country's agricultural land and produce 27% of total agricultural output."	Reimagining Argentina's agriculture sector (World Bank Group 2024b) World Agriculture Watch: Argentina (FAO 2024)	75% of Argentina's farms are family farms
"Inflation in the 12 months through August reached 236.7%, still the highest level recorded in the world, and also above a Reuters poll forecast of 235.8%."	Argentina's August inflation still stubborn as residents struggle to save (Reuters 2024)	High inflation rate in Argentina
"Argentina maintains export taxes on many exports of agricultural products. Since 2008, Argentina has applied additional percentage-based export taxes on a range of products, including soybeans, soy meal, and soy oil. In addition, some products, such as beef and wheat, face export quotas."	Agricultural equipment (International Trade Administration 2023)	Export control policy in Argentina
"Export tax rates for tomato, lettuce and other vegetables remain at 5%."	New Export Tax Rates in Argentina (USDA 2020)	5% export tax rates for vegetables
"Over the past century, it has vacillated between economic growth and dysfunction, going from being one of the richest countries in the world to becoming one mired in a prolonged financial crisis, massive debt, and triple-digit inflation."	Argentina's struggle for stability (Roy 2024)	Political dysfunction and financial crisis for decades
"Average research & development expenditure per full-time agricultural researcher between 2015 and 2020: Bolivia is 0.26, Peru is 0.42, Columbia is 0.25, Uruguay is 0.23, Chile is 0.27, Mexico is 0.18, and Brazil is 0.43."	Unlocking innovation: Assessing the role of agricultural R&D in Latin America and the Caribbean (Nin-Pratt et al. 2023)	Argentina has significantly less in average R&D expenditure per full-time agricultural researcher, 2015–2020
"Non-competitive funding provided by the most important public institutions that carry on science and technology in Argentina."	Non-competitive funding of the Argentine national system of science and technology (STIP COMPASS 2023)	Limited public funding