

Resilience in Agri-Food Retail: Understanding Supply Chain Adaptation in India and Bangladesh

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Abstract

Global supply chains are facing increasing vulnerabilities due to climate change, geopolitical tensions, and economic disruptions. The agri-food sector is particularly susceptible to such shocks due to its high perishability, fragmented supply networks, and dependency on multiple stakeholders. While existing research on supply chain resilience (SCRES) has largely focused on farmers and large agribusinesses, the resilience mechanisms of small agri-food retailers—critical intermediaries in developing economies—remain underexplored. This study aims to fill this gap by investigating the resilience-building strategies of rural retailers in India and Bangladesh, offering insights into how small-scale actors adapt and sustain operations in volatile environments.

Drawing on survey data from 1,362 retailers (433 in India, 929 in Bangladesh), this study employs descriptive analysis, chi-square tests, and a logit regression model to examine key resilience enablers. Our findings indicate that while strong supplier relationships and inventory management improve resilience, access to finance and training remain critical bottlenecks. Notably, Indian retailers benefited more from long-term supplier relationships, enabling them to manage disruptions effectively, whereas Bangladeshi retailers relied on preparation strategies such as stockpiling. Surprisingly, information sharing among supply chain actors did not significantly

enhance resilience in either country, suggesting systemic inefficiencies in knowledge dissemination.

Keywords: agri-food resilience, retailers, India, Bangladesh, agri-food supply chain

1. Introduction

Supply chains worldwide are facing increasing vulnerabilities due to climate change, geopolitical tensions, and economic disruptions. Risks repeatedly instigate the supply chain stakeholders to adopt resilience initiatives to mitigate these risks (Handfield et al., 2020). Under such circumstances, persisting, adapting, and transforming strategies to new and improved practices throughout the supply chain are essential (Stone & Rahimifard, 2018). Building resilience through such strategies in the supply chain can be considered a step forward in managing unavoidable disruptions (Hohenstein, et al., 2015). The concept of what makes a supply chain resilient has been evolving over time. From a more engineering resilience approach, it is being expanded to adapt and transform approach (Nikookar et al., 2024). SCRES involves developing adaptive capabilities to deal with multiple dynamic circumstances of small-scale chronic threats (Tukamuhabwa et al., 2017), as well as developing transformation capabilities to be able to grow post-facing disruptions (Wieland et al., 2023).

The past studies conducted on the resilience of supply chains have primarily focused on a cluster of developed countries in North America and Western Europe (Gölgeci and Ponomarov, 2013; Tumkamuhabwa et al., 2015). Although the developing world faces a unique set of challenges, very limited studies have been conducted on the Global South. The developing countries are all at various stages in the development of the supply chains (Scholten et al., 2020). Due to large differences in economic and cultural factors, countries respond differently to risks and develop

different capabilities to build SCRES (Zhao et al., 2022). Therefore, results obtained from the developed countries cannot simply be applied to the developing countries (Razak et al., 2024). The ‘one-size fits all’ concept is not applicable here as the context of the country-specific challenges changes the methods of obtaining resilience (Seuring et al., 2021).

Food supply chains are more complicated than most others due to higher uncertainty, risks, and high interdependency among these stakeholders. The complexity gives rise to higher concerns about their impact on the environment and economy. As a result, it is complex to achieve a resilient and sustainable agri-food supply chain (Mundi et al., 2019). Agri-food supply chains comprise activities including multiple players. It starts from farming to processing to distribution and, finally consumption. In between, several steps like transportation, warehousing, packaging, etc. make the system highly complicated. Such a complex chain requires coordination from all the stakeholders (Tsolakis et al., 2014; Zhao et al., 2020, Ali et al., 2023). Moreover, developing countries adopt and invent strategies to overcome an increased number of disruptions as per their need (Weiss et al., 2011). This complex and important supply chain holds huge research potential.

Small farms are responsible for a major fraction of the rural employment. They make a significant contribution to the development of the region (Lezoche et al., 2020). Therefore, most of the existing studies in the agri-food sector mainly focus on farmers' resilience. However, multiple stakeholders are associated with the farms- farmers, middlemen, retailers, and customers. Thus, it is particularly necessary to study the individual players and the factors that can develop SCRES. Retailers in the agrifood sector hold a significant position as they face multiple challenges and act as a bridge between the suppliers and the customers. Yet, the agrifood retail sector is largely unexplored in literature.

Drawing from the above discussion, we aim to bridge this gap in the literature and develop survey-based empirical research investigating the underlying mechanisms that lead to supply chain resilience among the rural retailers of India and Bangladesh. We investigate the mechanisms that contribute to the persistence, adaptation, and transformation of operations and explore the multi-tier resilience dynamics in small-scale retailers navigating different resilience pathways depending on their resource constraints and institutional environments. Further, we probe into the constant opposing tensions that small-scale retailers face in creating SCRES. We develop the following research questions for our analysis:

Q1: What are the resilience capability factors adopted in agri-food supply chains in India and Bangladesh?

Q2: What mechanisms differentiate persistence, adaptive, and transformative resilience in agri-food retail supply chains?

Q3: What opposing tensions do the retailers face while adopting strategies to build SCRES?

We attempt to answer these research questions by surveying retailers in the district of Nalanda (Bihar), India, and the districts of Rajshahi and Rangpur, Bangladesh. This study makes several important theoretical contributions to the SCRES literature. First, it extends the persistence-adaptation-transformation framework (Adobor & McMullen, 2018) by demonstrating how small retailers navigate different resilience pathways depending on their resource constraints and institutional environments. Second, it engages with paradox theory (Harland, 2021) to highlight the tension between resilience-enhancing strategies (e.g., supplier diversification) and

the structural barriers that limit their effectiveness (e.g., financial constraints). Third, it contributes to the emerging discourse on resilience in under-represented contexts in the Global South.

We have arranged the paper by discussing the existing literature and the capabilities or enablers of resilience in the second section. In the third section, we discuss the methodology and data collection. In the fourth section, we analyze our survey data, followed by the discussion, theoretical contribution, and practical implications, and provide our concluding remarks along with the future scope of research in the last section of the study.

2. Literature Review

2.1. SCRES and Agrifood Sector

The food industry has been one of the biggest contributors to GDP in many countries worldwide. The contribution of the industry has been significantly higher for developing countries than for developed countries. In China, the contribution of the food industry is 17.8%. For India, the figure is 18.3%, and in Pakistan food industry contributes 22.7% of the GDP. Comparatively, the contribution of the industry in the USA is 5.2% and only 1.9% in Australia (World Bank, 2021). Despite contributing significantly to the GDP, the majority of the studies conducted on the agrifood sector focus on the Global North. The large contribution of the industry in the developing country makes it essential for researchers to explore.

With the rise in population, there is a constant rise in demand for food products. The sustainable development goals are designed to improve agrifood production and distribution to meet the increasing demand of future generations (Spanaki et al., 2021). The changes in practices include moving from a more industrial and efficiency-driven approach to an eco-friendly and resilience-focused approach to face the disruptions (Dong, 2021).

Agrifood products are mostly perishable and the production amount and quality every year depend highly on the climate and other surrounding factors. Such circumstances with multiple stakeholders and heavy dependence on natural conditions make the supply chain highly vulnerable and prone to facing risks (Pereira et al., 2021). There is a need to develop a risk management culture to mitigate such threats. Such a risk management culture can bring changes in day-to-day operations among the entire supply chain and reduce risks faced (Liu et al., 2023). Such changes in operation contribute to resilience in the supply chain. With significant differences in political, economic, and cultural factors, different countries respond differently to risks and develop different capabilities to build a resilient supply chain (Zhao et al., 2022). We aim to find empirical evidence of which factors contribute to resilience among retailers in India and Bangladesh.

2.2. SCRES Enablers

Resilience has been defined differently by various researchers. The most broadly used definition of resilience defines it as the ‘capability of a supply chain to prepare, resist and recover from and adapt to adverse situations’ (Ali et al., 2017; Shishodia et al., 2023; Zhao et al., 2022). It settles on the key concepts of preparation for disruptions, response to changes, recovery from disturbances, and return to the original state (Tukamuhabwa et al., 2015; Scholten et al., 2020; Razak et al., 2024). To achieve these key concepts, the authors have studied agri-food supply chains in depth and listed various enablers that contribute to the resilience of the ASFC. Enablers are proactive and reactive measures that are taken along the supply chain to avoid vulnerabilities and risks (Ali et al., 2017).

‘Knowledge management’ has been one of the most recurring enablers in past studies. Knowledge governance management is one of the factors that help facilitate communication and collaborative relationships among suppliers, retailers, and customers. However, a lack of trust in the agrifood

market causes hindrance to a smooth and transparent information flow (Anastasiadis & Poole, 2015). Customers are more likely to build a trusting relationship if they are aware of the full life cycle of a product. It is crucial to encourage building trust as it is the smoothest way to develop a knowledge management system. A collaborative system encourages constant communication among the stakeholders regarding information about changes in supply and demand (Ali et al., 2017). A longer association between the supplier and retailer builds a more trusting relationship and better communication (Ali & Arslan, 2023; Ramos et al., 2023). Such transformations in the system can reduce sudden shocks and help build SCRES. Small-scale retailers who deal with customers directly are often more resilient than bigger corporations. They can connect with the customers and develop a relationship, creating a resilient bond (Nordhagen et al., 2021).

Building on trust, a longer association with a supplier has been associated with resilient structure in the literature (Ali & Arslan, 2023; Ramos et al., 2023). A longer association helps the supply chain actors to adapt to changes due to lengthier understandings among themselves. Moreover, it is argued that a diverse number of suppliers enables the system to be more capable of absorbing sudden shocks of disruption as a negative impact on one of the players may not be spilled onto the others (Gupta et. al., 2021; Wahdat & Lusk, 2023).

Technology-advanced supply chains benefit during adverse demand shocks. E-commerce or other advanced methods can absorb some of the shocks by making the supply chains transparent and traceable and, as a result, more resilient. Finances and lack of knowledge about the implementation and benefits of technology often prevent firms from adopting it (Dalenogare et al., 2018). Hence, it is necessary for regulatory authorities and the government to focus on providing financial aid and required training to improve skills and adopt a technologically advanced system (Guo et al., 2022). Along with financial and training aid, building appropriate storage facilities or equipping

existing facilities with required temperatures can help the development of agrifood SCRES (Gupta et al., 2021). Having suitable storage provisions that can maintain inventory for changes in demand or supply helps in developing a resilient supply chain (Ramos et al., 2023). Therefore, institutional support plays a crucial role in obtaining SCRES.

Zhou, et al., (2022) and Zhao, et al., (2022) take a different approach and do not suggest only technological advancement for effective traceability. They argue that traceability can be ensured by implementing regulations that mandate information disclosure and by conducting regular inspections of the AFSC. Information disclosure and regular review of the retailers and suppliers in an agri-food market encourage adaptability to a more transparent system and stakeholders who are closely associated with the firms show a greater impact of inspection on transparency. Therefore, government regulations can play a crucial role in building SCRES.

Additionally, diversification in operation has proved to make the supply chain more resilient (Wahdat & Lusk, 2023). Diversification capacity can be achieved through training and active knowledge transfer among participants (Coopmans et al., 2021; Zhao et al., 2022; Stevens & Teal, 2023). Modernization paradigm entails specialization of operations to achieve economies of scale. Higher collaboration and information sharing can help in making the firms more diversified. However, such a shift often makes the firms more vulnerable to market forces like price volatility, causing a fall in resiliency. But economies of scope make the firms more diversified, and it becomes easier to follow a resilient pathway throughout the supply chain (de Roest, et al., 2018).

2.3.Theoretical Background

In earlier studies, SCRES only referred to engineering resilience (Holling, 1996). Engineering resilience focuses on the restoration of the original state of affairs swiftly after facing a disruptive

event (Rice & Caniato, 2003). Such an efficiency-based way of defining resilience was adopted due to the negative association with the term disruption (Durach et al., 2015). With the evolution of resilience strategies, it has expanded to other forms, such as ecological and evolutionary resilience. SCRES was redefined by Wieland and Durach (2021) as “the capacity of a supply chain to persist, adopt or transform in the face of change”. The current definition no longer perceives disruptions as negative as it provides a potential to adopt new transformative strategies and witness growth post disturbances (Wieland et al., 2023).

Efficiency measures of resilience are often adopted before the onset of a disruption to maintain persistent operations through the course of the disturbance. To maintain resilience and efficiency in operations, a set of stable preset conditions are followed through disruptions (Wieland, 2021). However, Ecological studies show that following such optimized systems does not suit well as they force the system to lose its capability of adapting to new conditions (Evans, 2011). Such conditions may end up forcing the system to lose its resilience capabilities. Hence, Supply chains should be able to adapt to changing circumstances to maintain resilience.

Adaptation capability is perceived as part of the entire transformation or transition throughout the disruptive state (Pelling, 2011). It is a spectrum with small changes to deal with volatilities, as well as large-scale and non-linear adaptations to overcome disruptions (Wise et al., 2014). Existing knowledge and learnings within the supply chain evolve into creating adaptive capabilities in the face of disruptions (Birkie et al., 2017). However, most adaptive practices are found to be short-term and reactive (Hodgkinson et al., 2014).

In the long-term, growth is expected to be achieved post-recovery from the disruptions (Adobor & McMullen, 2018). Such transformation capabilities are suggested to develop through experiences and training to overcome disruptions (Blackhurst et al., 2011). Wieland (2021) terms the

transformation capabilities post disruptions as ‘dancing’. It allows the system to transform simultaneously while adapting. Transformation capabilities encourage the supply chain to experiment and innovate. The transformed state is presumed to be more desirable and on an altered path (Davoudi et al., 2013). Therefore, such an improved and desirable path post-transformation is received as a positive aspect of disruptions in supply chains.

Thus, the literature suggests multiple enablers of building agri-food resilience by developing efficiency, adaptive, and transformative capabilities. We aim to employ these concepts from the literature and investigate the pathway that rural agrifood retailers follow to develop resilience capabilities in India and Bangladesh.

3. Methodology

3.1. Research Design

South Asia is one of the densest populated regions in the world with heavy dependence on agriculture (World Bank, 2021). Some regions of India and Bangladesh are very similar in climatic conditions, culture, and agricultural practices. Hence, they are comparable. Therefore, the data used for the analysis in this study comes from a survey of retail shops and food outlets conducted in India and Bangladesh. The districts of Nalanda from India and Rajshahi and Rangpur from Bangladesh were chosen as they are similar in climatic conditions and face issues due to weather fluctuations. Moreover, these areas suffer from high rates of malnutrition, social inclusion, gender-related issues, and poverty despite being extremely fertile for agricultural use. The locations of the survey are marked in Figure 1 indicating the physical proximity.

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3.2. Data Collection

A census of retailers in Nalanda, Rajshahi, and Rangpur was conducted. From the list of retailers listed in the census, in India, all greengrocers and specialized shops were identified. Specialized shops are shops that specialize in selling one specific item only, for instance, meat, milk, eggs, etc. A maximum of 6 local grocers and 3 food stalls were identified randomly from each village with at least 50% female owners where applicable. All paan/ tobacco shops were excluded from the sample. Finally, 433 shop owners were interviewed.

In Bangladesh, all convenience stores, groceries, tea stalls, bakeries, snacks and street food stalls, vegetable and fruit stores, and meat stores were identified from all villages in Rajshahi and Rangpur. A maximum of 5 local groceries, restaurants and tea stalls, specialized shops, and vegetable and fruit shops were randomly selected. Out of 5, 3 female-owned shops and 2 male-owned shops were selected wherever applicable. All paan and tobacco shops were excluded from the sample. Finally, 929 shop owners were interviewed.

Through a series of structured questions, the participants were asked about the details of their business, the various disruptions faced by them, and their ways of overcoming hurdles. To keep the survey agile, questions that required quantifying any aspects of their business were avoided. The questions asked were multiple-choice or categorical questions. All the participants provided consent to participate in the survey.

3.3. Data Analysis

Data were cleaned and analyzed using Stata SE15 (StataCorp, 2017). We performed descriptive analysis and chi-square tests to recognize the trends in the face of disruptions. Further, following Nordhagen et. al. (2021), we developed a logit model to understand which factors that enable the farmers to be more resilient and manage the disruption.

In our Logit model, we consider the dependent variables as the ability of retailers to prepare for disruption and being able to manage disruption after its occurrence to measure their adaptive and transformative capabilities. Preparedness indicates the resilience capabilities of the retailers before or in anticipation of the disruptions. Management of the disruptions indicates the resilience capabilities of the retailers during and after the shock. If a retailer reported that they had saved to face any adverse shocks, maintained a good relationship with supply chain actors to control disruptions, maintained additional storage facilities, obtained insurance or stocked products, or maintained any other personal method of preparedness, then it was considered as being prepared for the disruption. If the retailer reported to have taken no actions to prepare for the disruption, then it was considered as not being prepared. In the logit model, the dependent binary variable p_i takes the value of 1 for being prepared, otherwise 0. Similarly, post the occurrence of disruption, if the retailers reported having managed the business by borrowing, relocating shop, diversifying or specializing products, offering home delivery, providing credit facility, or any other personal method of management, then the dependent binary variable m_i takes the value of 1. If the retailer claimed to have not taken any action to manage the disruption, then the binary variable takes the value of 0. Equations (1) and (2) represent the logit model used in our analysis.

$$p_i = \alpha + \beta_1 y_i + \beta_2 \text{suf}_i + \beta_3 s_i + \beta_4 d_i + \beta_5 \text{fi}_i + \beta_6 \text{ch}_i + \beta_7 t_i + \beta_8 \text{fs}_i + \mu_i \dots\dots\dots (1)$$

$$m_i = \alpha + \beta_1 y_i + \beta_2 \text{suf}_i + \beta_3 s_i + \beta_4 d_i + \beta_5 \text{fi}_i + \beta_6 \text{ch}_i + \beta_7 t_i + \beta_8 \text{fs}_i + \mu_i \dots\dots\dots (2)$$

The independent variables were chosen based on the enablers associated with firm resilience in the literature. We use independent variables like whether multiple suppliers (s_i) are used, duration of association with the supplier (d_i), a free flow of information among the stakeholders is encouraged (fi_i), and the ability to react to changing demand (ch_i). The model is controlled with the variables; years in business (y_i), whether sufficient stock is maintained (suf_i), whether the

retailers have gained training (t_i), and obtained financial support (fs_i). The subscript 'i' represents the retailer.

4. Findings

4.1. Firm Characteristics

In India, 433 retailers were interviewed. Despite aiming to collect data from male and female retailers equally, approximately only 26% of the firm owners were female in the final survey. Of all the shops, only 2.5% were registered and the rest were unregistered and informal. The average number of years for which the businesses were running was found to be 8.5 years with one shop running for over 41 years. Almost all the shops (99.3%) operate every day of the week for over 10 hours a day. One-third of the shop owners attended high school (31%), 16.4% did know how to read or write without any formal education, and above 10% of the shop owners were graduates or above. In India, 66% of the respondents comprised local grocery stores, followed by specialized stores (13.6%) and restaurants and tea stalls (12.7%).

In Bangladesh, 56% of the respondents came from the district of Rajshahi and 44% came from the district of Rangpur. A total of 929 retailers were interviewed. The survey aimed to include three-fifths female respondents and two-fifths male respondents. However, the final dataset comprised only 11% of female shop owners. A higher number of shops (20%) were licensed in Bangladesh compared to India, but 80% were not licensed. The average duration of the business running was found to be 7.9 years, with a maximum being 50 years. Almost all businesses were operating every day of the week with over 10 hours of opening hours. One-third of the respondents in Bangladesh could read and write without going to school (29%) and 19% only went to primary school. More than half of the respondents comprised owners of local grocery stores (58%) and 30.5% of responses were from restaurants and tea stall owners.

The key firm characteristics are tabulated in Table 1 for easier comprehension.

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4.2. Impact of Disruptions

Approximately 58% of the Indian retailers reported having experienced some sort of disruption in the last three years and only around 30% of the retailers in Bangladesh faced disruption. However, both the Indian and Bangladeshi retailers stated COVID-19 as the main disruption in that period (99% and 93% respectively). The second most occurring disruption was economic crisis (India 21% and Bangladesh 9%), followed by poor management of business (India 16% and Bangladesh 1%). A negligible number of retailers faced disruptions due to flood, death or illness, and network related issues. Drought, social conflicts, or product-related issues did not cause any disruptions in the recent past. Figure 2 below shows the types of disruptions.

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It was observed that overall a greater proportion of Indian retailers were impacted by the disruption compared to their counterparts in Bangladesh. 58% of the local grocery stores, 47% of restaurants and tea stalls, 53.2% specialized shops, 73.6% vegetable and fruit shops were impacted by the disruptions in India. Comparatively fewer retailers were impacted in Bangladesh. Only 28% of grocery stores, 36%, 45% of specialized shops, and 38% of vegetable and fruit shops were affected.

In India, restaurants and tea stalls were most severely affected compared to other types of retailers. Over 88% of the restaurant owners faced the disruption very severely. Two-thirds of the retailers in the other category were impacted severely and around one-third of all others face it severely. Whereas, in Bangladesh, approximately half the retailers from all types of businesses felt the

impact of disruption and one-third from the other category of retailers faced it severely. Table 2 below summarises the impact and severity of the disruption based on the type of retailer.

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All the retailers in both countries faced several impacts as a result of the disruption. Most of the retailers had to close their businesses temporarily (82% in India and 73% in Bangladesh) due to the interruption and faced loss in sales (74% in India, 66% in Bangladesh). A significant number of retailers had to change their livelihoods (40%) and went into debt (42%) in Bangladesh, but only 13% changed their livelihoods and 22% of retailers went into debt in India. However, very few retailers have faced job losses. Figures 3a and 3b represent the major immediate impacts of disruption on the retailers and customers respectively.

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From the retailers' perspective, customers also faced the impact of the disruption. Over 80% of the customers faced difficulties in shopping due to the lack of regular opening hours and around 60% and 65% faced low availability of products in India and Bangladesh respectively. They also had to offer higher prices for the same products (33% in India, 28% in Bangladesh).

4.3. Which Retailers Appear to be More Resilient?

Retailers from both countries adopted various strategies to deal with the disruptions. It was observed that the retailers in Bangladesh were less likely to be impacted severely by the disruptions after following different coping strategies. More than one-third of the retailers adopting strategies

such as improved sanitation, offering longer service hours, changing shop image, increasing the number of suppliers, selling different units of products, offering transparency and knowledge sharing, or taking loans reported severe impact of disruption on their business in India. Comparatively, less than 20% of the retailers in Bangladesh who adopted such strategies reported such severe impacts.

A similar number of retailers who changed their storage spaces and stocked up their products reported severe impact. However, some of the strategies, such as providing home deliveries and adopting personalized advertisements were more effective in India compared to Bangladesh. Over 71% and 60% of the Bangladeshi retailers were impacted severely following these strategies. In India, advertisements had no significant impact on the business and 58% of the retailers offering home delivery were affected severely.

All the retailers who insured their business were severely impacted by the disruption in India, but insurance did not have any significant impact on the businesses in Bangladesh. More than half the retailers offering promotional discounts were also severely affected in India (59.5%) but did not have any impact in Bangladesh. Table 3 below lists the differences in the severity of the impacts based on the adoption of various strategies.

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To better understand the factors influencing resilience during disruptions, we estimated a logit model predicting the likelihood of a retailer reporting the capability to manage the disruption immediately and the likelihood of being prepared for the same based on different characteristics. From equations (1) and (2), we obtain the marginal effect of the independent variables on the dependent variables. Tables 4 and 5 depict the results of the marginal effects.

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The marginal effects from the logit regression show that having multiple suppliers is more likely to prepare Indian retailers for the disruption, but less likely to prepare retailers in Bangladesh. Whereas receiving financial support encourages retailers in Bangladesh to prepare, Indian retailers are less likely to prepare. Additionally, receiving training, being associated with suppliers for a longer period, and keeping sufficient stock are more likely to prepare Bangladeshi retailers for the disruptions, but do not have any significant impact on the Indian retailers. Longer years of operating experience discourage retailers in Bangladesh from preparing for disruptions.

Retailers with longer experience in operating businesses are more likely to be able to manage disruption in India compared to their Bangladeshi counterparts. In India, retailers with longer duration of being associated with the suppliers and keeping safety stocks are more likely to be able to manage the disruption. But in Bangladesh, although safety stock and being a part of a training program implies a higher likelihood of being able to manage disruption, having a free flow of information among suppliers and retailers, and being associated with a supplier for too long is associated with a lower likelihood of being able to manage an interruption.

4.4. Actions Taken to Mitigate the Impact of Disruptions

Approximately 95% of the retailers from both countries claimed to monitor market demand closely to predict changes due to disruptions. The most common method of monitoring market demand is observing the number of customers who demand a product (India: 94% and Bangladesh 91%). Monitoring the competitor's performance is a common method of monitoring in India (84%), but not so popular in Bangladesh (29%). Keeping a track record of the supplies for the customers is

more commonly used in Bangladesh (45%) compared to India (15%). Other popular methods of monitoring market demand are tracking how much customers are willing to pay for a product and gathering direct feedback from potential customers. Figure 4 represents the ways of monitoring market demand.

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After the onset of disruptions, retailers adopt several methods of management of the disruption (Figure 5). Borrowing to continue the business is the most adopted strategy in both India (54%) and Bangladesh (67%). Availing credit facilities (45%) and diversifying the products (34%) are also commonly adopted in India. However, over 30% of the retailers did not reach the disruption and did not take any action.

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The biggest learning for the retailers in India (59%) and Bangladesh (75%) has been to save for emergencies. In India, 46% of retailers expressed the need to explore market opportunities, and 56% of them believed that improving networks can help overcome disruptions. A lesser proportion of retailers learned these strategies in Bangladesh (24% and 11% respectively). Other learnings from the disruptions involve increasing credit networks (India: 38% and Bangladesh: 21%) and less than 10% of the retailers believed changing market strategies would help face disruptions in business. Figure 6 below tabulates the learnings from the disruptions.

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5. Discussion

To investigate the answers to our research questions, we collected data from agrifood retailers in the districts of Nalanda in India and Rajshahi and Rangpur in Bangladesh. Finally, 433 and 929 retailers were interviewed in India and Bangladesh respectively. The target was to have 50% and 60% female respondents in India and Bangladesh respectively. However, in the final survey, only 26% of the respondents were female in India and 11% of the respondents were female in Bangladesh. Despite actively seeking female respondents, such biased gender dynamics portray a male-dominated retail sector in agrifood supply chains. Almost all the retailers (Over 93% in both countries) interviewed mentioned COVID-19 as the main disruption they have faced in the last year, but 58% of the Indian retailers stated facing the impact of the disruption and only 30% of the retailers in Bangladesh stated that they have faced the impact. This wide discrepancy in reporting might have arisen due to the different methods of handling the pandemic by the local government, portraying that the institutional policies and influence of local authorities have a significant impact on small-scale retailers who are heavily dependent on day-to-day operations.

From the literature, we identified diverse enablers that contribute to resilience among the supply chain actors and empirically observed their impact on the retailers in our study. Ali et. al. (2017) focuses on engineering resilience and the ability to meet changing demand in the market rapidly as one of the key factors in achieving resilience. We found that preparedness for disruption among retailers from both countries was not significantly impacted by their ability to meet changing demands during disruption, neither did it improve their capability of managing the disruption. The small retailers in these regions have a local customer base with limited products. The changes in demand under major disruptions did not witness high deviations. Hence, the capability of being able to meet changing demands did not benefit them in the persistence of the original state of

business in the face of disruptions. Therefore, it is necessary to diversify the products and services to attract a wide customer base to develop resilience (Wahdat & Lusk, 2023).

Association with multiple suppliers for a longer duration is expected to aid in persisting operations and overcome disruptions (Ramos et al., 2023; Wahdat & Lusk, 2023). In our model, we found that although the duration of the association with suppliers had no significant impact on the preparedness of retailers in India, they were more likely to be able to manage disruption. In Bangladesh, a longer duration of association with suppliers made the retailers more likely to be prepared for the disruption, but less likely to be able to manage it. This might be because 72% of retailers in Bangladesh reported that their suppliers are located in a different geographical area and accessibility is reduced during disruptions. Hence, changing strategies of the operations prior in anticipation of disruptions was easier for them compared to adapting to the changes during the shock. Under such circumstances, transformation to create local networks to reach a better state of growth post-shock plays a fundamental role. Having multiple suppliers helped the retailers in India be more prepared, but reduced the likelihood of preparedness for Bangladeshi retailers and did not have a significant impact on the disruption management capability. The diversification in terms of suppliers did not benefit the Bangladeshi retailers.

Owing to the perishable nature of agricultural products, researchers have found a lack of appropriate logistics as another cause of weakness in the agri-food supply chains. However, keeping sufficient stocks of products helps in developing adaptive capabilities to the changing demands and assists in creating SCRES (Gupta et al., 2021, Ramos et al., 2023). In our analysis, the results were found to be in line with the literature. We found that keeping sufficient stock of products for disruptions did increase the likelihood of retailers preparing and managing disruptions

in Bangladesh. But, in India, it did not significantly impact preparedness but increased the likelihood of being able to manage adverse situations.

Having a reliable source of finance provides an opportunity for the entire supply chain to develop structural and functional innovations and develop transformational capabilities with improved techniques and technologies. Such capabilities can aid in achieving a resilient and sustainable AFSC (Chen et al., 2023). Almost half of the retailers in Bangladesh (42%) did not have any reliable source of financial support. Consequently, it is reflected in the response to disruption. 42% of the respondents from Bangladesh went into debt following the disruption. The respondents who received financial assistance were more likely to be prepared for disruption and it did not have a significant impact on management. In India, over 83% of retailers received reliable financial support, but it reduced their likelihood of preparing and managing disruptions. This might be the result of a lack of training received from regulatory authorities on the ways of managing operations and funds. Over 98% of the respondents reported having no training and it did not have any significant impact on their preparedness and management of disruption. In Bangladesh, too, 99% of the respondents did not receive any training, but the remaining few did show a higher likelihood of being prepared and being able to manage disruptions. Therefore, to aid adaptive and transformational capabilities, there is a dire need for awareness and financial assistance among retailers.

Collaboration or information flow is not only considered to increase preparedness to face risks but also help in developing capabilities to respond to disruptions as having a transparent system with open communications helps in making cross-functional decisions (Hendry et al., 2019; Ramos et al., 2023). Therefore, we analyzed the impact of easy information sharing among stakeholders on preparedness and management of disruption. We observed that the factor did not have a significant

impact in India, but in Bangladesh, retailers were less likely to prepare or be able to manage disruptions with easy information flow. Hence, it can be stated that information sharing does not help in either of the countries. This might be because of the lack of reach among these small rural retailers. They do not obtain appropriate information from relevant sources which can help in handling disruptions and hence free flow of information does not create a positive impact.

Thus, we answer our first research questions through the discussion above. We find that to build resilience, Indian retailers depend on having long-lasting and stable supplier networks and effective inventory management. Bangladeshi retailers primarily depend on stockpiling to adjust to disruptions.

6. Theoretical Contribution

The development of our empirical study has two main theoretical contributions. First, we extend the persistence-adaptation-transformation framework for resilience (Adobor & McMulle, 2018) among one of the most under-represented stakeholders of the agrifood supply chain- the retailers in the Global South. We contribute to the framework by exploring how small-scale retailers with very limited access to resources navigate through resilience pathways.

We find that maintaining stocks to meet changing demands and persistent operations does not help retailers build resilience in the long run. Having multiple suppliers aids in adapting to changing circumstances, but does not contribute to transformation capabilities to manage disruptions after the occurrence. Retaining sufficient inventory enables retailers to dedicate their resources to developing transformative resilience that helps in managing business during and after disruptions. However, we observe that training, financial aid, access, and easy flow of information are the

primary bottlenecks of the system and these factors can aid in achieving a transformative capability to develop resilience (Blackhurst et al., 2011).

Thus, we answer our second research question. For retailers in developing countries like India and Bangladesh, persistence and adaptive capabilities are more easily achievable within the system compared to transformational capabilities. Although there are certain transformative approaches, the lack of institutional support in providing training and dissemination of relevant information plays a major role in creating such a barrier.

Our second theoretical contribution materializes while answering the third research question. We engage the paradox theory to explain the opposing factors that the retailers handle during their operations. While navigating through the approaches of the retailers to develop a resilient system, we observe multiple opposing tensions they face constantly. Diversification in products and maintenance of stocks to meet changing demands can contribute to SCRES, but the retailers do not have access to safe and secure storage facilities for their products. Moreover, they do not have access to financial aid to diversify or expand their business.

Through collaboration and creating a strong network of suppliers, resilience can be built. The retailers maintain an easy information flow to navigate through changes. However, they are unable to reap the benefits as there is a lack of dissemination of relevant information that might help them in their operations. Therefore, it can be concluded that the retailers face multiple opposing tensions. Navigating through such tensions can be eased by institutional support through appropriate channels of information sharing, targeted training, and financial aid.

7. Practical Implications

Our research offers a route to creating a resilient supply chain environment for small-scale rural retailers by comparing factors that help in preparing for and managing disruptions. For example, a longer association with the suppliers helps manage disruptions, but it is not beneficial when the supplier is not located in the same geographical area as the retailer. Therefore, it is necessary to create a strong local supply chain network for the retailers. Small-scale retailers develop interpersonal relationships with customers and often find it easy to predict and match changing demands, but it does not help in obtaining resilience due to low variability in changing demands. Diversifying the product base to attract a wide variety of customers may help in building resilience. Effective stockpiling and inventory management are key features in building resilience. To maintain necessary stocks, there is a need for infrastructural facilities, like cold storage which are often not accessible to small-scale rural retailers. Institutional support plays a crucial role in assisting with such needs. The lack of infrastructural facilities has been one of the major issues for increasing food wastage (Spada et al., 2018). Therefore, policymakers must design strategies to make these facilities available to small retailers and other small-scale stakeholders. Investment in localized storage infrastructure can enhance resilience by reducing dependence on unpredictable supply chains.

We find that surprisingly, there are no benefits of easy information flow observed among these retailers. This indicates a lack of availability of relevant information among the players. There is a systemic failure in the dissemination of relevant information which needs to be addressed. Policymakers need to focus on the dire need for awareness and training programs among retailers. The existing programs are often targeted at large-scale retailers or farmers, with no attention being paid to the middlemen or small-scale retailers. Efforts must be made to strengthen local supply chain networks and improve knowledge transfer mechanisms. There is also an unavailability of

financial assistance or insurance facilities for the retailers which needs attention from policymakers. Financial support and targeted training programs are essential to build resilience capacity, especially among micro-retailers who lack institutional backing.

Local Non-governmental Organisations can contribute to the development of an overall resilient supply chain by hosting awareness campaigns for the dissemination of relevant information among these retailers. The NGOs can create self-help groups in this sector and assist in obtaining training, financial help, and insurance for any loss during disruptions.

This research plays an important role in developing a sustainable, stable, and resilient food system. It is expected to not only benefit retailers and policymakers but also other players in the supply chain, like traders, farmers, and consumers by creating a pathway to address risks, increase efficiency, and improve the overall food system not only in the targeted regions but worldwide.

8. Conclusion and Future Research Opportunities

In our study, we aim to explore the resilience capabilities of the agri-food retailers in India and Bangladesh in the agri-food sector. We interviewed retailers from the Nalanda district of India (Bihar) and the Rajshahi and Rangpur districts of Bangladesh. We find that the retail sector of the agri-food supply chain in both countries is male-dominated. The major disruption faced by these businesses in the recent year was due to the COVID-19 pandemic. We identify the enablers of resilience from the literature and empirically find their impact on our respondents. It is observed that retailers from both countries behave differently when compared.

Longer duration of association among retailers and suppliers was found to help Indian retailers in managing disruptions and Bangladeshi retailers prepare for them. Keeping a sufficient stock of products helped retailers from both places to be able to manage the adverse impact of disruptions,

hence it is necessary to develop appropriate storage facilities along the supply chain. Lack of training and availability of credit facilities showed difficulty among retailers in preparing and managing disturbances in both countries. Therefore, it is of utmost need to design the required training among the supply chain actors and make credit facilities available. Retailers from both countries did not show a significant impact based on the easy flow of information. Such a contradiction from the literature might have arisen due to the lack of reach of the stakeholders. Appropriate information does not reach the players through reliable sources and the retailers are unable to reap the benefits of easy flow of information.

Despite slight differences in reaction among the retailers in both countries, it is clear that the lack of appropriate storage facilities, credit facilities, training, and information flow causes a hindrance in achieving a resilient agri-food supply chain. Policymakers and local governments should focus on providing such facilities to retailers, farmers, and other stakeholders to develop a resilient supply chain.

Our study contributes to the SCRES literature by extending the persistence-adaptation-transformation framework (Adobor & McMullen, 2018) by exploring the various resilience strategies adopted by the rural retailers of India and Bangladesh. Second, we probe into the paradox theory (Harland, 2021) to highlight the constant opposing tensions that retailers face between resilience-enhancing strategies and the structural obstacles that constrain their efficiency. Third, it contributes to the emerging discourse on resilience in the under-represented developing world.

Even with the best of our efforts, there are certain limitations in our study. The survey was conducted with objective and multiple-choice questions to keep it agile and easy to analyze. Open-ended questions were not asked, which hindered obtaining detailed and personal experiences of

retailers in the face of disruptions. Over 90% of the retailers mentioned COVID-19 as the biggest challenge they have faced in the last three years. The impact of COVID might have been different than other natural disasters. Different disruptions were not explored individually in our study. Additionally, Bangladesh is over-represented in our survey as the number of retailers interviewed in Bangladesh is over double the number of interviewees in India. This skewed number of observations may lead to a rise in biased results.

The area of resilience among small-scale retailers holds huge potential for future research. Further studies can be conducted with open-ended questions to gain an understanding of the personal experiences of retailers in the face of disruptions. Moreover, longitudinal studies can be conducted to explore the evolution of resilience over time and assess the role of digital transformation in enhancing supply chain robustness.

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TABLES

TABLE 1

Firm Characteristics

	India		Bangladesh	
	n/std	Percentage/Mean	n/std	Percentage/Mean
	dev.		dev.	
Female owned	115	26.6%	103	11.09%

Possess license	11	2.5%	185	19.91%
Years in business	8.5	8.5	7.9	8.9
Operates everyday	430	99.3%	920	99.00%
Category of retail shop				
Vegetable/ fruit shop (greengrocer)	30	6.9%	52	5.6%
Local grocery store	286	66.1%	540	58.1%
Specialized shop (meat, milk, fish, egg)	59	13.6%	45	4.8%
Restaurants and tea stalls	55	12.7%	283	30.5%
Convenience store/ Minimart	3	0.7%	9	1.0%
Educational qualification of shop owner				
Not literate	71	16.4%	55	5.9%
Can read and write (did not go to school)	15	3.5%	271	29.2%
Primary school (upto class 5)	39	9.0%	176	19.0%
Secondary school (class 6 to 8)	68	15.7%	134	14.4%
High School (class 9 and 10)	134	31.0%	167	18.0%
Higher secondary (class 11 and 12)	59	13.6%	90	9.7%
Graduate and above	47	10.9%	36	3.9%

TABLE 2

Firms impacted by disruptions

Type of retail store	India		Bangladesh	
	Impacted by	% of	Impacted by	% of businesses
	disruptions	businesses	disruptions	affected
		affected		severely by
		severely by		disruptions
		disruptions		
Local grocery store	57.6%	30.6%	27.8%	48.5%
Restaurants and tea stalls	47.2%	88.2%	36.5%	43.3%
Specialized shop (meat, milk, fish, egg, etc.)	53.2%	35.7%	45.1%	46.9%
Vegetable/ fruit shop (greengrocer)	73.6%	37.0%	38.5%	52.3%

TABLE 3

Differences in severeness of impact based on adoption of different strategies

Strategy Adopted	India	Bangladesh
	% of firms	% of firms
	impacted	impacted
	severely	severely

Improved sanitation	34.0%***	2.4%**
Longer service hours	43.5%***	11.3%***
Offering home delivery	58.1%***	71.4%***
Changing the shop's image and inventory by adding new products	47.2%***	21.4%***
Increased number of suppliers	33.4%***	21.5%***
Use of different storage spaces	26.9%***	20.5%***
Increased number of smaller size packs or units of products offered	35.9%***	8.4%***
Free flow of information among all stakeholders	32.8%***	12.7%***
Knowledge of operating assets of other stakeholders	33.7%***	7.9%***
Personalized advertisement strategies	26.7%	60.0%***
Offering promotional discounts	59.5%***	0.0%***
Product specialization	76.5%***	2.6%***
Loan	43.7%***	20.2%***
Saving to face shocks	40.1%***	11.9%***
Good relationship with supply chain actors	26.5%***	16.9%**
Additional storage facility	32.0%**	0.0%***
Insurance	100.0%***	33.3%
Stocking	37.9%***	36.5%

Note: p-value refers to the Pearson Chi-squared test statistic; We compare firms that adopted the above-mentioned strategies with the ones that did not adopt such strategies.

(* represents $P < .05$, ** represents $P < .01$, *** represents $P < .001$)

TABLE 4**Likelihood of Being Able to Prepare for Disruptions**

Retailer characteristics	India	Bangladesh
	Marginal effect	Marginal effect
Years of operating experience	0.001	-0.004**
Ability to meet changing demand	-0.024	0.037
Multiple suppliers	0.092***	-0.082**
Duration of association with supplier	0.047	0.121***
Sufficient stock to meet disruptions	0.019	0.329***
Received training	-0.072	0.084***
Received financial support	-0.129***	0.309**
Easy information sharing among stakeholders	-0.033	-0.065**

(* represents $P < .05$, ** represents $P < .01$, *** represents $P < .001$)

TABLE 5**Likelihood of being able to manage disruptions immediately**

Retailer characteristics	India	Bangladesh
---------------------------------	--------------	-------------------

	Marginal effect	Marginal effect
Years of operating experience	0.010 ^{***}	-0.009 ^{***}
Ability to meet changing demand	-0.087	0.046
Multiple suppliers	0.039	0.026
Duration of association with supplier	0.111 ^{***}	-0.075 ^{***}
Sufficient stock to meet disruptions	0.273 ^{***}	0.107 ^{***}
Received training	-0.092	0.106 ^{***}
Received financial support	-0.200 ^{***}	0.204
Easy information sharing among stakeholders	0.041	-0.154 ^{***}

(* represents P<.05, ** represents P<.01, *** represents P<.001)

FIGURES



FIGURE 1

Locations of the survey

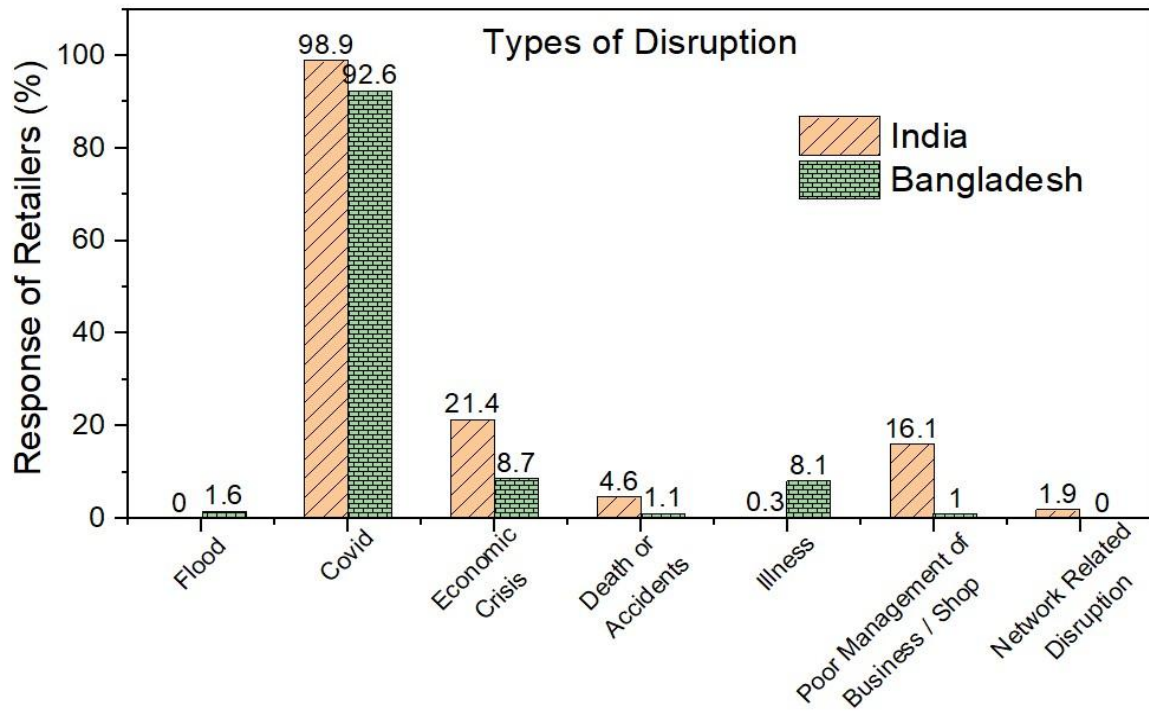


FIGURE 2

Types of disruption and their occurrence country-wise

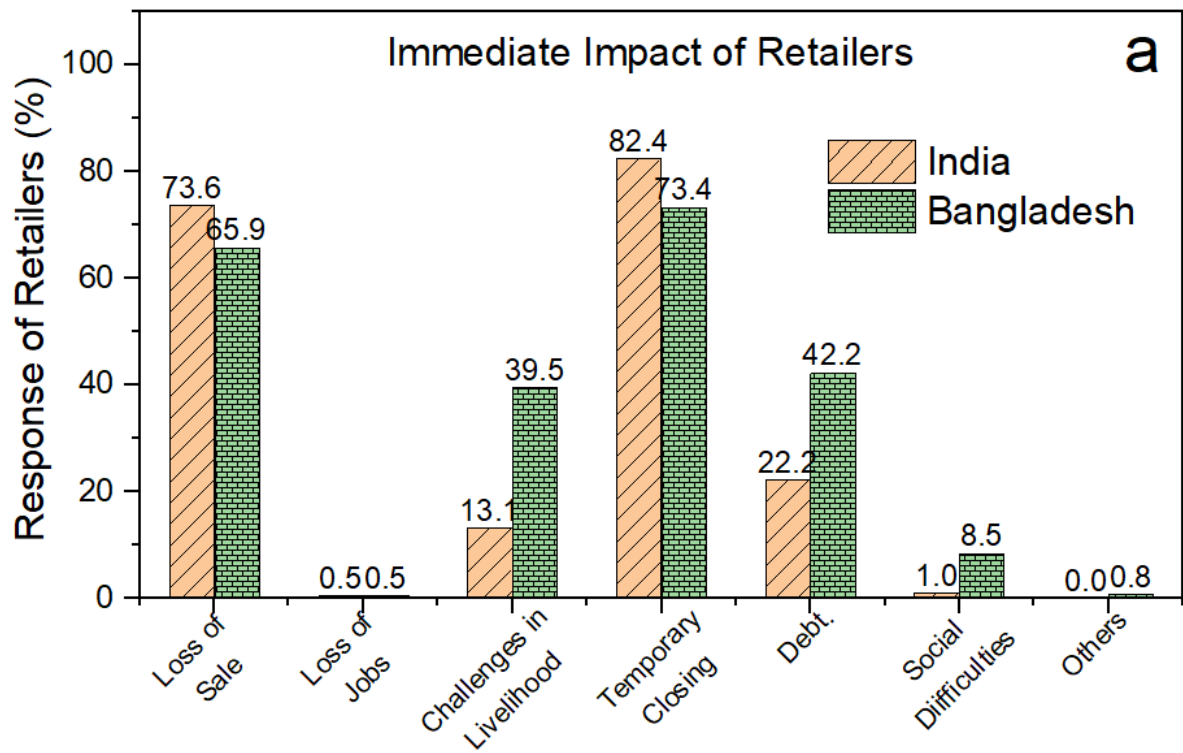


FIGURE 3a

Immediate impact on retailers

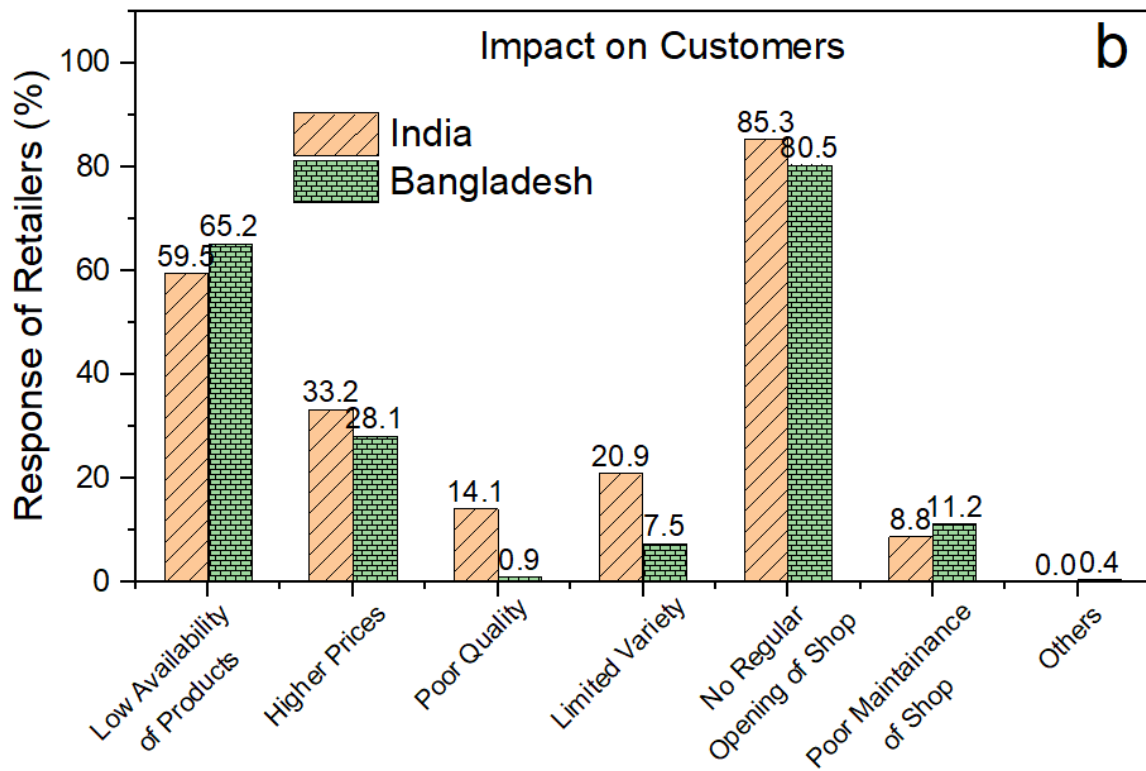


FIGURE 3b

Immediate impact on customers

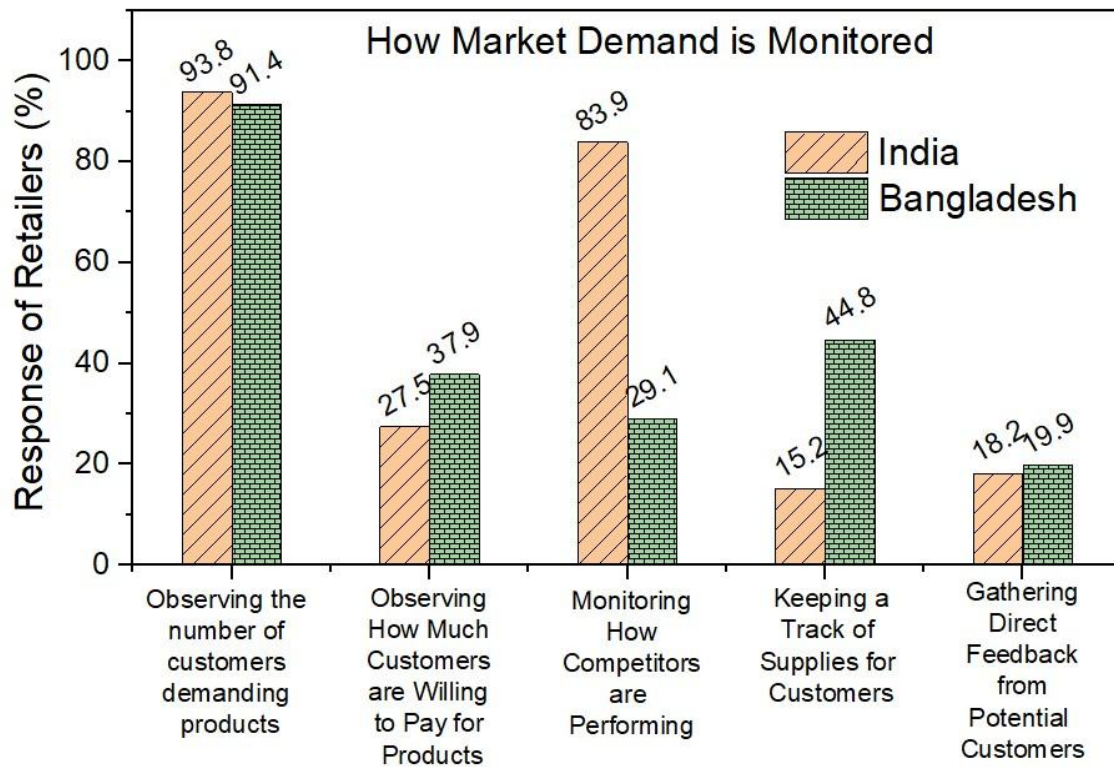


FIGURE 4

Methods of monitoring market demands

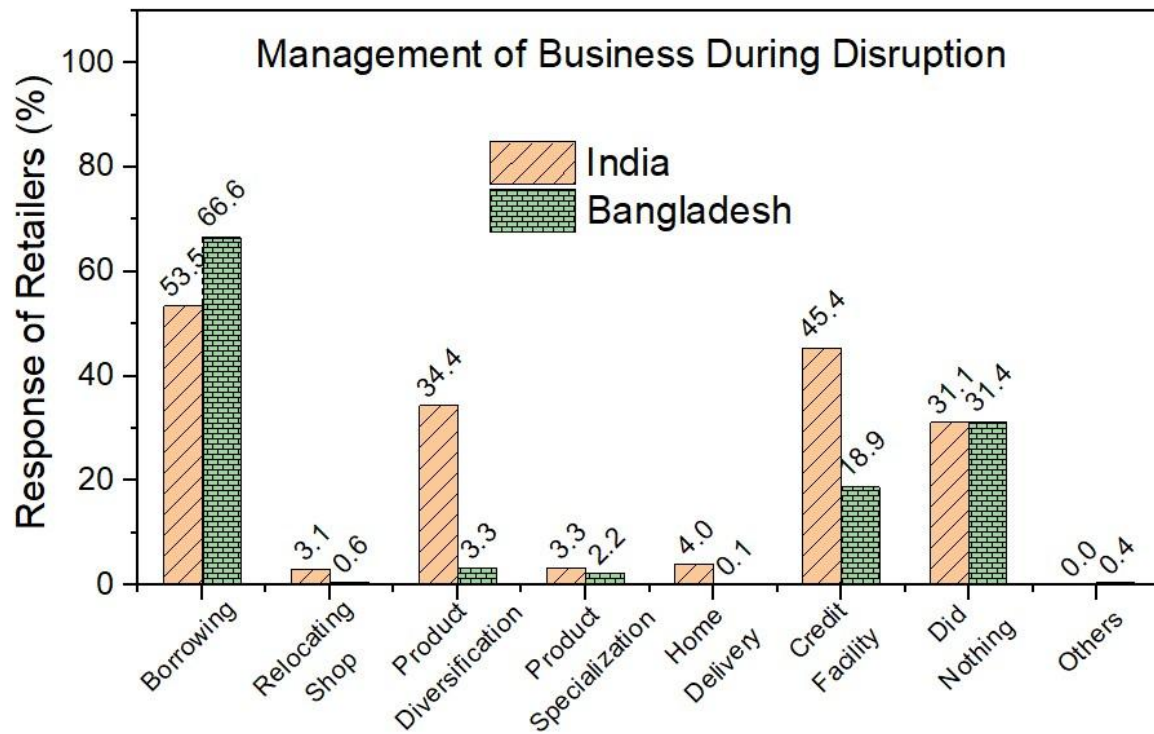


FIGURE 5

Methods adopted for business management during disruptions

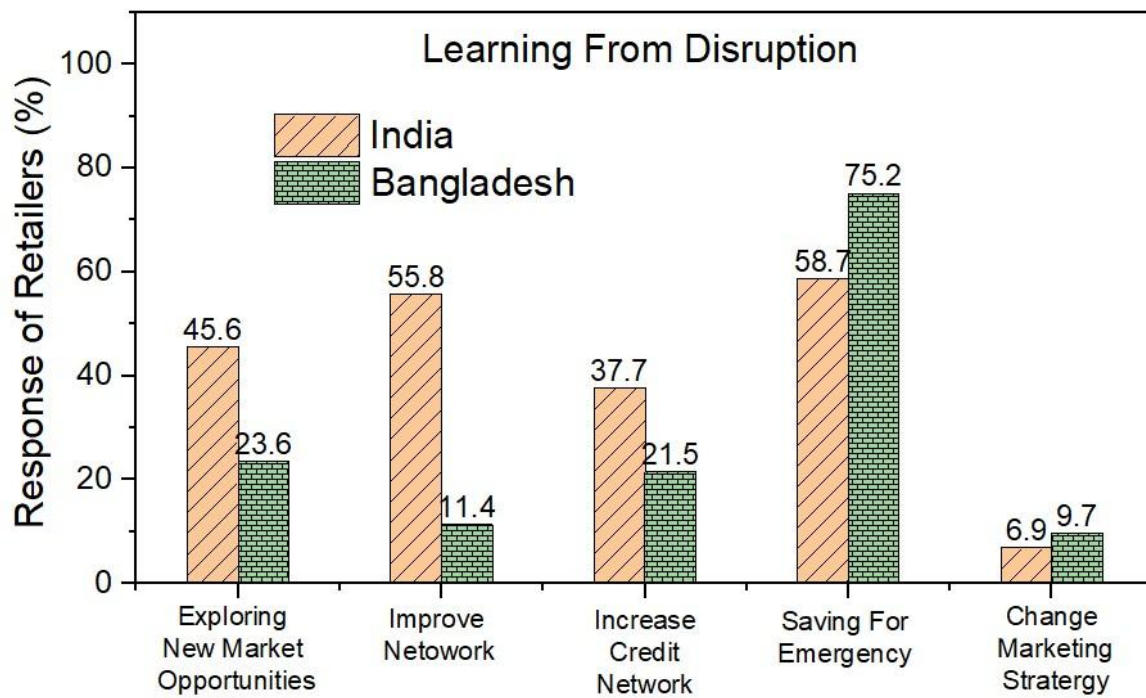


FIGURE 6

Learnings from disruptions