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Building Disaster Resilient Micro-enterprises in the Developing World

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Building disaster-resilient micro enterprises in the developing world

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Family-owned micro enterprises operating within the informal sector of most developing countries provide millions of citizens with a livelihood and are the economic backbone of many communities. Yet, the turbulence that emanates up or down respective supply chains following a disaster can cause these entities to fail. This study develops a model that recognises the relative weakness of micro enterprises to such disaster-related shocks. The model proposes that micro enterprises can moderate the effect of such shocks by creating resilience through cognitive preparation, continuous learning, and the generation of various forms of social capital (cognitive, relational, and structural). The propositions for the model are established through an extensive literature review, coupled with examples drawn from the documents of humanitarian agencies performing disaster relief work in India. This model also serves as a preliminary basis with which to derive metrics to set benchmarks or to assess the viability of a micro enterprise's ability to survive disaster-related shocks.

Keywords: disaster, disruption, humanitarian, micro enterprise, supply chain

Introduction

Natural disasters are becoming increasingly frequent (Altay, 2008) and costly (Horwich, 2000), disrupting supply chains around the globe. When a major disruption occurs, everyone along the supply chain is affected to some extent (Kouvelis, Chambers, and Wang, 2006; Altay and Ramirez, 2010). As such, micro enterprises operating in the informal economy can be affected by a disruption to the supply chain even if they are not directly affected by a disaster.

In many developing countries, the informal sector is the backbone of the local economy. The informal economy generally is defined as income-earning activities unregulated by the state in contexts where similar activities are so regulated (Roberts, 1994). This informal sector often is composed of hundreds or even thousands of micro enterprises; some of them take advantage of niche opportunities, whereas others continue lines of traditional business handed down through generations.

Micro enterprises have been found to be particularly vulnerable to disaster-related shocks emanating from their supply chains. This vulnerability occurs because, relative to larger organisations, micro enterprises have limited internal resources, lack the capacity to acquire formal assistance in a time of need, and are less likely to have access to formal credit and insurance markets. Informal risk-coping strategies that are used to smooth sudden shocks break down when all members of a risk-sharing group also are affected by the same disaster (Murdoch, 1999; Lustig, 2000). Hence, transient

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shocks can have permanent effects by preventing the repurchase of productive assets (such as livestock) that are sold when the enterprise owners are in dire need (Carter et al., 2007). Such patterns were noticed in the case of the Indian Ocean tsunami (December 2004) and the Haiti earthquake (January 2010), given the particular vulnerability of the informal sectors in these areas to disaster-related disturbances along their supply chains. For example, the tsunami caused major socioeconomic losses among a large number of micro enterprises in southern India (Groots, 2005).

In addition, micro enterprises frequently are unable to obtain the post-disaster aid of humanitarian agencies. Governments, international non-governmental organisations (INGOs), and other non-governmental organisations (NGOs), henceforth collectively called humanitarian operations and crisis management (HOCM) agencies, find it easier and more efficient to distribute aid in a top-down centralised manner, using existing channels. A majority of the micro enterprises are in remote rural areas and may not be well served by a centralised approach.

Sobel and Leeson (2006), in their critique of the Federal Emergency Management Agency (FEMA)'s response to Hurricane Katrina (August 2005), argued that the top-down disaster response system of the Government of the United States focuses too much on control (Quarantelli, 1988) and may not reach or meet effectively the expectations of small enterprises. Furthermore, micro entrepreneurs, who often belong to marginalised communities and vulnerable social groups, might not be able to attract attention or have the capability to provide the necessary documentation that HOCM agents require to distribute aid. As such, 'ex-post' disaster aid tends to reach the larger enterprises in the formal sector. Following the Gujarat (India) earthquake (January 2001), for instance, there was unequal distribution of aid: upper caste members who tended to be better educated and had social connections obtained a greater proportion of relief relative to members of vulnerable social groups (India Development Service, 2001). Finally, if micro enterprises do receive financial aid it tends to be minimal and not sufficient to recapitalise the business.

In the aftermath of a disaster, therefore, micro entrepreneurs are likely to be severely affected. The failure of micro enterprises can be particularly devastating for poor communities, especially as such enterprises tend to be the sole source of income for many families. Moreover, vulnerable communities in developing countries cannot rely on government safety networks. Thus, it is vital to develop effective strategies to ensure the survival of micro enterprises experiencing the effects of a disaster.

This study proposes an 'ex-ante' bottom-up capacity-building approach to improve micro enterprises' resilience to supply chain disruptions caused by disasters. The model seeks to demonstrate that an 'ex-ante' approach by NGOs, governmental agencies, and other parties involved with HOCM could help micro enterprises to build resilience prior to a disaster. Drawing on several literature streams, as well as archival documents of HOCM agencies, the study suggests that micro enterprises could enhance their resilience capability by preparing cognitively for the effects of disasters. This preparation includes creating a state of awareness and attentiveness to supply chain disruptions and by learning from previous disruptions. Micro enterprises also

could develop various types of social capital to mitigate or cope with supply chain disruptions due to disasters.

The following section examines the relevant literature related to micro enterprises and disasters and develop a model and propositions linking resilience capability and micro enterprise survival. This is followed by a discussion of how the proposed model could be employed by NGOs, governments, and other HOCM agents to help micro enterprises become resilient to disasters. The paper concludes with some suggestions for future research.

Disaster-resilient micro enterprises

A pragmatic approach to ensure the survival of micro enterprises would be to use existing social structure (Dynes, 1994) in responding to disasters. If one considers social units to be bankable resources, then augmenting the capacity of a social unit or a social network so that it could endure the initial blow of a disaster would increase its likelihood of survival and success. The process of social capacity-building should involve not only NGOs, donors, and governmental agencies; it should also incorporate existing actors within a society (Eade, 1997), including micro enterprises and their supply chain partners. When micro enterprises in supply chain networks are engaged in the response to a disaster, their capacity to recover from that disaster, as well as from future disasters, is enhanced (Comfort, 1999).

This study develops a model and propositions by synthesising the literature on social capital, disasters, organisational learning, high-reliability organisations (HROs), and supply chain management. In addition, it uses archival documents from humanitarian relief efforts relating to micro enterprises in India to support and ground the model and the propositions.

India is a large developing country where a majority of businesses are micro enterprises. The country provides a diverse setting in terms of disasters (avalanche, cyclone, drought, earthquake, flood, tsunami), terrain (mountain, desert, tropical), densities (city, metropolis, village), and standard of living; such diversity adds to the generalisability of the proposed model.

Specifically, the study examines several disaster relief activities during the cyclone in Orissa in 1999, the earthquake in Gujarat in 2001, and the tsunami in southern India in 2004. The archival documents include reports describing the field visits of various NGOs, interviews with disaster relief officials/NGOs, and discussions with micro entrepreneurs who were hurt by the disasters. These documents help to support propositions and to demonstrate the potential applicability of the proposed model in guiding NGOs and other HOCM agents in helping micro enterprises become resilient.

The following subsection assesses the literature on resiliency, HROs, organisational learning, social capital, and the effects of disasters on the survival of micro enterprises, to develop a model and derive a number of propositions.

Micro enterprise performance in a time of disaster

The supply chain literature identifies three types of performance measures: financial; operational; and time-based (Chen and Paulraj, 2004a). Financial performance measures centre on the use of outcome-based financial indicators that reflect the fulfilment of micro enterprise goals such as profitability and sales growth. Operational performance measures reflect the efficiency and effectiveness of operations within the firm, and are related to quality, flexibility, and the ability to accommodate customers' special requests. Time-based performance measures include delivery speed and reliability, new product development time, production lead time, and swiftness of response to customers.

Disasters can be devastating to the informal economy (Andersen, 1991). Micro enterprises operating in this sector are tiny and lack organisational 'slack' resources (Nohria and Gulati, 1996) to buffer disruptions to their supply chains. Hence, the financial, operational, and time-based performance of many micro enterprises deteriorates so significantly 'ex-post' disaster that they fail. Without access to commercial credit, they are unable to build up their finished goods inventory or to stock up on raw materials to protect against supply chain disruptions. Often, micro enterprises are less sophisticated and lack the knowledge of how to deal with disruptions. For instance, documents of the Self Employed Women's Association (SEWA), an India-based NGO aiming to organise women workers for full employment, note that small enterprises have less capacity to mitigate risk, unlike larger enterprises that enjoy access to formal sector resources, such as those of the banking sector (India Development Service, 2011).

The individual capacity of the owner of a micro enterprise also can influence its performance in a time of disaster. An indirect impact of a disaster on a micro enterprise could be a decrease in the owner's sense of efficacy. Anderson (1991, p. 24) argues that, 'when people in a developing society have a sense of their own ability to affect and manage outcomes, they will produce more'. A decrease in perceived efficacy owing to a disaster could endanger the survival of a micro enterprise.

Micro enterprises in the informal sector are also less likely to receive disaster aid, which contributes to their failure. Although HOCM agents are active when major disasters strike, many micro enterprises are affected by small-scale disasters that do not bring forth HOCM aid; 'beyond major events, there are lots of smaller "disasters" that can put the vulnerable family businesses in trouble, small earthquakes and a lack of rainfall can easily put families in dire straits' (India Development Service, 2011, p. 2). Generally, no aid is forthcoming for these smaller events. Even when disaster aid is available, businesses frequently need to document losses to acquire it. However, the long-term direct and indirect economic damage caused by a disaster is difficult to measure (Tol and Leek, 1999), especially among micro enterprises within the informal economy where usually there is a lack of documentation on business activity (Peskin, 1989). Thus, micro enterprise performance suffers in the event of a disaster.

The above discussion suggests that micro enterprises are less able to cushion disruptions to their supply chains and are less likely to obtain disaster aid. This leads to the following proposition:

Proposition 1: micro enterprises are less likely to survive a disaster as compared to other organisations.

Building resilience capability in micro enterprises

Resilience is viewed as a critical objective of HOCM by both academics and practitioners (FEMA, 2000; International Strategy for Disaster Reduction, 2004), and it is defined in multiple ways in the literature. In the field of sociology, resilience is defined as the 'capacity to cope with unanticipated dangers after they have become manifest, learning to bounce back' (Wildavsky, 1991, p. 77). A similar definition of resilience is employed in the sphere of supply chain management, and revolves around the ability of a network to re-establish itself (Sheffi, 2005). Synthesising the resilience literature and taking a perspective beyond restoration, Lengnick-Hall, Beck, and Lengnick-Hall (2011) define organisational resilience as the ability of an organisation to develop effectively a specific response to a major disruption, and potentially capitalise on it. In disaster-related research, community resilience refers to the ability to mitigate hazards effectively, contain losses, and recover rapidly from disasters (Tobin, 1999; Bruneau et al., 2003). This paper adapts the definitions for organisational and community resilience to the disaster setting and further defines resilience capability as a micro enterprise's ability to mitigate and respond effectively to, and ultimately to capitalise on, the disruptions caused by disasters.

Disaster-related disruptions to a supply chain often are unexpected and affect every echelon. They increase uncertainty in supply, in internal operations, and in demand. Frequently these disruptions are perceived as inevitable. Resilient organisations are better prepared to withstand and absorb the impacts of environmental disruptions, respond to disrupting shocks more effectively (Lengnick-Hall and Beck, 2005), and adjust successfully under challenging conditions (Sutcliffe and Vogus, 2003). Such organisations are able to absorb the consequences of disruptions and return quickly to normalcy. Hence, micro enterprises that are resilient should be able to dampen the negative effects of supply chain disruptions caused by disasters.

Documents from HOCM agencies support this notion. After the Gujarat earthquake in India, for instance, the SEWA was instrumental in helping micro enterprises become resilient by enabling workers to take their future in their own hands and become self-reliant with respect to livelihoods and capacity-building (India Development Service, 2001). Notwithstanding major catastrophic events, the micro enterprises in Gujarat that have built up a resilience capability have been able not only to survive, but also to thrive, in spite of multiple smaller disaster-related shocks over the past 10 years (India Development Service, 2011). In contrast, micro enterprises that have been unable to develop such a capability are more likely to fail and push families into dire poverty.

The points above support the assertion that a resilient micro enterprise tends to survive supply chain disruptions. This leads to the following proposition:

Proposition 2: a micro enterprise's resilience capability will moderate positively the negative relationship between the likelihood of its survival and the impact of a disaster.

Building resilience capability then is key to micro enterprises surviving a disaster. Fusing the literature from the fields of organisational resilience, supply chains, and disasters, and considering the resource limitations faced by many micro enterprises in developing countries, the following subsections elaborate on how micro enterprises can increase their resilience capability. This can be done by drawing on three fundamental types of intangible resources: (i) cognitive preparation for supply chain disruptions; (ii) learning from experience of dealing with disasters; and (iii) exploiting different forms of social capital.

Cognitive preparation for supply chain disruptions

To recover effectively from a disaster, a micro enterprise needs to be prepared cognitively to bounce back from a disruption. According to research on managerial cognition, a cognitive frame (that is, a lens created by an individual for filtering information to understand a phenomenon) largely influences how a manager views a situation and directs his or her response to it (Walsh, 1995). Research on HROs (such as air traffic control systems, nuclear aircraft carriers, and nuclear power generation plants) also notes the importance of cognitive frames. HROs are situated in environments in which the potential for error is overwhelming and there is a constant risk of failure; yet these organisations consistently manage the potential for failure while achieving reliable performance (Roberts, 1990; La Porte and Consolini, 1991). Such HROs are resilient because their employees are prepared cognitively for potential problems through a high level of awareness and attentiveness to their situational context, and they have the capacity to respond to relevant small signals (Weick and Sutcliffe, 2001, 2007; Swanson and Ramiller, 2004). High levels of awareness and attentiveness to potential trouble spots become a cognitive frame directing employees' responses in HROs. As a result, HROs are more cognitively prepared for potential risks and failures. Typical forms of behaviour in HROs include a focus on pinpointing potential trouble spots in internal operations and persistent guarding against potential failures. This is similar to what Rochlin (1993, p. 14) describes as the 'suspicion of quiet periods' in HROs.

A concept from the supply chain literature that is similar to HRO's awareness and attentiveness to internal operations is 'supply chain disruption orientation'. Drawing on the supply chain risk management literature (Sheffi, 2005), as well as research related to firm orientation (Narver, Slater, and MacLachlan, 2004) and entrepreneurial orientation (Lumpkin and Dess, 1996), Bode et al. (2011, p. 837) define supply chain disruption orientation as 'a firm's general awareness and consciousness of, concerns about, seriousness toward, and recognition of opportunity to learn from supply chain disruptions'. Investigating firms' responses to supply chain disruption, Bode et al. (2011) found that organisations with an orientation towards expecting high levels of supply chain disruption were more likely to act in the wake of such an occurrence.

Based on this research, one can state that a micro enterprise that is prepared cognitively for potential supply chain disruptions is more likely to find weak spots in its

supply chain and act to strengthen them, eventually resulting in increased resiliency. Documents concerning HOCM disaster relief efforts support this idea: a post-tsunami study—conducted on behalf of the Worldwide Fund for Nature (Delhi office)—of the coastal districts of Andhra Pradesh in India provides some evidence of early alertness to potential signs of disaster. The document notes that 'a few villagers, most of them farmers, noticed something odd prior to the disaster – dogs disappeared, birds left and even the elephants went up into the hills . . . those farmers were able to prepare and incurred less loss' (India Development Service, 2011, p. 21). Unfortunately, some 'fisherman were oblivious to the threat of a Tsunami and went out to fish and never came back' (India Development Service, 2011, p. 21). In addition, SEWA documents report that, following the Gujarat earthquake, micro enterprises are 'much more cognizant of the effects of disaster and do better planning for disasters (big and small)' (India Development Service, 2011, p. 1).

In sum, micro enterprises with high levels of awareness and attentiveness to supply chain disruption are more vigilant to changes in their supply chain and are more proactive in searching for potential weak spots in it. Such micro enterprises are more cognitively prepared for supply chain disruptions. This leads to the following proposition:

Proposition 3: a micro enterprise's level of cognitive preparation for a disaster will influence positively its resilience capability.

Learning from experience of dealing with disasters

Many developing countries are vulnerable to natural disasters and repeatedly suffer floods, mudslides, storms, and other events. Micro enterprises in these countries have an opportunity to learn from experience and to develop resources and skills that provide a basis for informal action within their communities (Comfort, 1994).

Organisational learning theory (Argyris and Schön, 1996) can be used to understand how communities organise themselves to respond to disasters. Comfort (1994, p. 13) asserts that striking a 'balance between anticipation and resilience, order and chaos', requires a process of continual learning. In this continual social learning process, representations of the major shared experiences of social groups, families, or communities are aggregated into a collective memory (Halbwachs, 1980). Given that micro enterprises are embedded in the informal community's social learning, they play a critical role when organisations react to external complexity with internal organisational means (Gröbler, Grübner, and Milling, 2006).

Disasters present opportunities to learn. At a time of disaster, people engage in questioning, self-reflection, and information-seeking, all of which increase opportunities for organisational learning (Kapucu, 2008). As such, learning is an important element in preparing a micro enterprise for supply chain disruptions. In addition, learning reduces response and recovery costs (Cooke and Rohleder, 2006; Altay, Prasad, and Tata, 2013), thereby enhancing resilience (Comfort, 1994).

Learning does not come easily or automatically to communities and organisations affected by disasters. A post-disaster setting can be a chaotic and politically-charged

environment in which information might be very ambiguous and normal information flows are disrupted (Sagan, 1993). HOCM agents need to invest in training programmes that provide a mechanism with which to capture the relevant information and to create a social learning process to build resilience among micro enterprises to future disasters.

For example, NGOs have promoted a number of learning activities based on experience of dealing with disasters. Notably, SAATH, an NGO aiming to empower India's urban and rural poor, organised several village meetings after the Gujarat earthquake to discuss the importance of building earthquake-proof houses. Such houses boosted the resilience of micro enterprises to disasters, given that the houses not only provided shelter but also often were a place for conducting business. SEWA also set up nine community-based learning centres in which entrepreneurs learn from each other; learning is augmented by a training programme called 'mini MBA' (India Development Service, 2011). Along similar lines, the Working Women's Forum, another India-based NGO aiming to strengthen the cultural, economic, and social status of poor working women, provided village committees and micro entrepreneurs with tsunami rehabilitation workshops (Groots, 2005). According to the India Development Service (2011, p. 21), 'in Andhra Pradesh fishermen were encouraged by NGOs to organize informal groups to communicate where they were going fishing, for how long, and consult with each other regarding weather conditions'.

These activities all focus on promoting organisational learning within a micro enterprise in order to increase resiliency. SEWA officials point out that micro entrepreneurs' income more than doubled owing to improvements in productivity and quality levels. The 'mini MBA' helped micro entrepreneurs to use their experience to manage better their financial risk, to gain knowledge of their markets, and to establish linkages. This additional capacity helped them to survive small and large disasters (India Development Service, 2011). This leads to the following proposition:

Proposition 4: a micro enterprise's ability to learn from disaster experience will influence positively its resilience capability.

Exploiting different forms of social capital

In a review of resilience studies, Luthar (2006, p. 780) concludes that 'resilience rests, fundamentally, on relationships'. There is also compelling evidence that social capital strengthens the resilience of micro enterprises (Biggs, 2011) and communities (Brouwer and Nhassengo, 2006). Specifically, Berke et al. (2008) examine how social capital is able to provide resilience to communities in relationship to risk. If social capital remains intact, disaster recovery tends to be quick and may even have a positive effect on the economy in the long run (Stewart and Fitzgerald, 2001).

Social capital is particularly useful therefore for understanding the antecedents of a micro enterprise's resilience capability, especially since most lack the capacity to obtain formal resources. Social capital has been defined as 'the sum of the actual and potential resources embedded within, available through, and derived from the

networks of relationships possessed by an individual or social unit' (Nahapiet and Ghoshal, 1998, p. 243). Social capital, in the form of network ties, can act as an information channel and provide access to resources, increase the efficiency of information diffusion, and minimise redundancies (Burt, 1992). Thus, social capital can facilitate access to broader resources of high-quality, timely information and practical business advice (Coleman, 1988); such resources could be extremely useful while coping with disaster-related disruptions. Social capital can also be the foundation of a quick response and mitigation efforts while facing disruptive and uncertain conditions (Lengnick-Hall, Beck, and Lengnick-Hall, 2011).

The following sub-subsections look at how micro enterprises can develop the three dimensions of social capital (structural, cognitive, and relational) to increase their resilience to disaster-related disruptions.

Structural social capital

The structural dimension of social capital refers to the overall pattern of connections between entities (Burt, 1992). Nahapiet and Ghoshal (1998) identified the attributes of structural social capital as the number of network ties (Wasserman and Faust, 1994) and network configuration (that is, the density, connectivity, and hierarchy of linkages) (Krackhardt, 1992). In a supply chain, structural social capital refers to the position of a micro enterprise and the presence or absence of ties between the micro enterprise and other supply chain parties. The position of each organisation in a supply chain network with respect to others reflects its capacity to provide value to others and could affect the resiliency of the organisation (Hakansson and Snehota, 1995; Chen and Paulraj, 2004b).

In the event of a disaster, material and information flows usually are disrupted, creating uncertainty and directly affecting the survival of micro enterprises. The structure of a supply chain, which represents where a micro enterprise is positioned, can determine the transmission of information and the level of access to critical resources. A micro enterprise that occupies a structural hole—that is, connects two non-redundant sources of information along the supply chain (Burt, 1992)—has the greatest capacity to provide value to others because it can influence the flow of information between people and organisations (Chen and Paulraj, 2004b). Hence, such a micro enterprise is more likely to obtain the necessary resources to mitigate the effects of disruptions owing to its position in the supply chain. Micro enterprises with strong structural social capital possess more ties with suppliers and customers. Expanding the number of these ties pre disaster would be helpful, as micro enterprises would gain the flexibility to migrate post disaster to alternative networks that have not been severely disrupted. In addition, the number of connections developed with other supply chain parties potentially could become substitute vehicles for the flow of information and materials. Investment in a dense network should be able to augment the quality of information flows between supply chain parties, extend upstream or downstream visibility, and enable continuity of operations. All of these actions should increase the resilience of a micro enterprise.

For instance, micro enterprises were able to access SEWA's network after the Gujarat earthquake (India Development Service, 2001). SEWA had an existing extensive network in the Kutch area of India. In the post-disaster setting, micro enterprises were supported by SEWA's upstream activities, such as procuring fodder for cows. What is more, SEWA was able to provide downstream support by providing market access through Kutch craft, the Banaskatha Mahila Association, and others (India Development Service, 2001).

Similarly, in the Krishna district of Andhra Pradesh, the NGO had a long-term (more than 10 years) relationship with local communities. Owing to the strong presence of the NGO, local communities were able to access necessary resources; they found that this relationship brought 'instantaneous' disaster relief. These local communities in Krishna were better organised and were able to recover faster than the two other coastal districts, Nellore and Prakasham, which were also significantly affected by the tsunami but did not have long-term relationships with their local NGOs (India Development Service, 2011). This leads to the following proposition:

Proposition 5: the structural social capital of a micro enterprise will influence positively its resilience capability.

Cognitive social capital

This dimension of social capital refers to cognitive attributes such as shared language, shared values, and shared common perspectives among entities (Nahapiet and Ghoshal, 1998). Cognitive social capital can be created through multiple interactions among supply chain members, fostering a constructive and positive conceptual orientation through a strong sense of purpose, core values, vision, and a common language (Collins and Porras, 1994). Since families or relatives often share the same value system, cognitive social capital typically is robust when the micro enterprise is composed of extended family or kin. Common goals and values result in strong organisational identification, connecting supply chain members emotionally and cognitively (Mael and Ashforth, 1992; Rousseau, 1998). Strong identification among supply chain members can engender a positive, constructive cognitive orientation and give a sense of direction during unfavourable environmental conditions (Collins and Porras, 1994). It encourages supply chain members to frame conditions in favour of preserving shared values and to take action to move forward despite disruption-related uncertainty (Dutton and Jackson, 1987). In addition, cognitive capital can serve as a substitute for financial capital in a time of need. When facing events that might endanger the survival of a particular micro enterprise, supply chain members who share the same values, vision, and purpose may be more willing to take appropriate steps to secure the micro enterprise.

Examples from the realm of disaster relief efforts demonstrate the importance of shared values for micro enterprises. For instance, documents from HOCM agencies indicate that some agencies seem they have their own set vision, solutions, and ways of working. The agencies have Western donors and mind-sets, and might not understand the different cultural norms, especially when designing income-generation

schemes; they need to tap in to local knowledge (India Development Service, 2011). In a similar vein, 'the government intervention also had its own prescription. The processes, ways of doing things and solutions were not necessarily compatible with the local culture – especially in tribal communities' (India Development Service, 2011, p. 2). If the same vision, values, and perspective are absent, the relief effort fails to build meaningful cognitive social capital for the micro enterprise, and it offers limited benefit to affected communities. In contrast, agencies such as SEWA that are better able to connect with local communities and their values, are also more effective at supplying disaster aid, partly because local NGOs have established relationships and know how to include locals in decision-making (India Development Service, 2011). This leads to the following proposition:

Proposition 6: the cognitive social capital of a micro enterprise will influence positively its resilience capability.

Relational social capital

The relational dimension of social capital refers to the intangible resources such as trust, obligations, and reciprocity embedded in relationships. In the context of this paper it pertains to the strength of ties developed by a micro enterprise with other members of the supply chain. This dimension is composed of attributes such as trust in the relationships (Fukuyama, 1995; Mishra, 1996), the 'willingness of individuals to define goals that are enacted collectively' (Leana and Van Buren, III, 1999, p. 542), and commitment to the relationships (Coleman, 1990; Uzzi, 1997). Relational social capital typically evolves from respectful interactions within an organisational community (Ireland, Hitt, and Vaidyanath, 2002). Respectful interactions are defined as ongoing interactions among organisational members based on trust and self-respect (Weick, 1993). Respectful interactions among micro enterprises and other supply chain parties can generate informed, intimate, trustworthy relationships (Uzzi, 1997), and result in collaborative sense-making (Weick, 1993).

Micro enterprises that have strong relational social capital have the ability to access a network of committed and trustworthy relationships among supply chain members, especially during disruptions. In such times, customers and suppliers are likely to be more collaborative in terms of lead times, costs, and credit if they have developed trust and mutually beneficial relations with micro enterprise owners over the years.

For example, SEWA has invested in developing relationships over the past 10 years and has essentially become part of the social network fabric on which micro enterprises can rely. This has occurred through 'a long term process of consultation that occurs every year' (India Development Service, 2011, p. 2). The trust developed over time has allowed SEWA to provide a revolving credit facility. Introductions by SEWA of upstream and downstream players have blossomed, with buyers and suppliers sharing market intelligence and quality specifications. As such, quality levels and productivity have improved dramatically, doubling the income of micro entrepreneurs (India Development Service, 2011). In contrast, a post-tsunami study of the

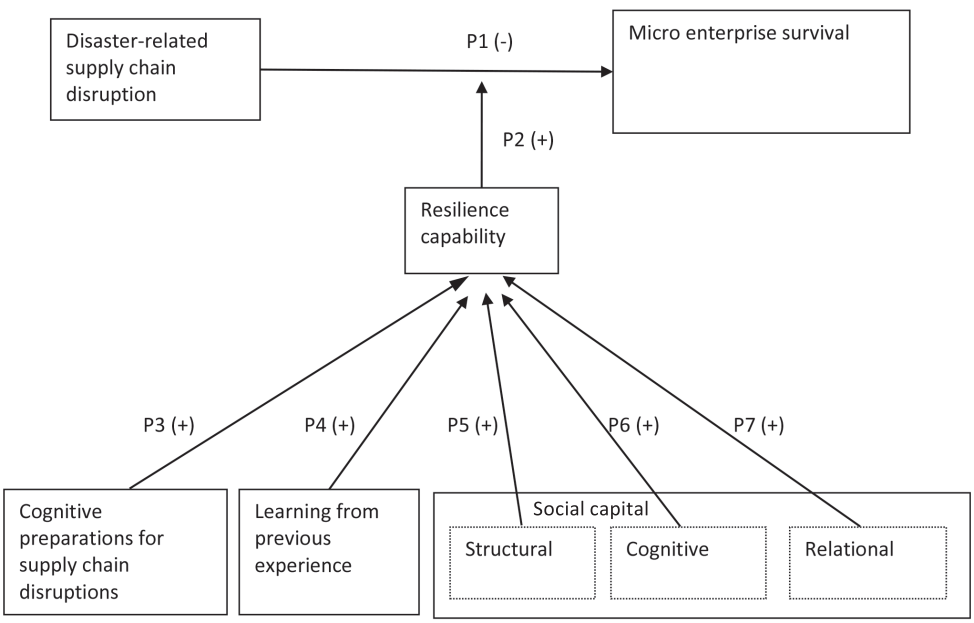
coastal districts of Andhra Pradesh found low levels of trust, commitment, and collaborative goals among micro enterprises and their respective buyers and suppliers. The entities could be considered as 'water-tight compartments' and not part of a supply chain system. In times of disaster, the buyers 'would seek to take advantage of vulnerable enterprises by raising the interest rates from 24% to 36%' (India Development Service, 2011, p. 21). Hence, most of the micro enterprises failed.

Being able to access a collaborative, trustworthy resource network during a period of disruption allows micro enterprises to garner the resources needed to cope with events that they might not normally be able to handle or respond to effectively (Leana and Van Buren, III, 1999). Research on resilience at the individual level also recognises that individuals who are able to forge strong relationships with others share key resources while facing adversity (Werner and Smith, 2001). Likewise, resilient micro enterprises can build committed, trustworthy relations with suppliers and customers, and, thus, secure requisite resources to support their adaptation to supply chain disruptions. This leads to the following proposition:

Proposition 7: the relational social capital of a micro enterprise will influence positively its resilience capability.

A series of propositions have been developed above to examine how the resilience capability of a micro enterprise influences its survival in a time of disasters. Figure 1 illustrates these seven propositions and summarises the proposed disaster resilience model for micro enterprises.

Figure 1. The proposed model for micro-enterprise survival.



Source: authors.

Figure 1 suggests that micro enterprises can develop a resilience capability through cognitive preparation, learning from experience, and building social capital. A strong resilience capability, in turn, affects the relationship between disasters and the survival of a micro enterprise.

Discussion

This study finds that, in comparison to larger organisations, micro enterprises in developing countries are more likely to fail in a time of disaster. Such entities are vulnerable to shocks along their supply chains caused by major and minor events. In addition, micro enterprises are less likely to benefit from disaster aid efforts for several reasons. Notably, disaster aid often is distributed in a top-down centralised manner, yet many developing countries lack the basic communication facilities and physical infrastructure to support the coordination requirements of such an approach. Furthermore, such facilities and infrastructure are compromised in a major disaster, frequently delaying the distribution of aid. Finally, many of the HOCM agents are from overseas and require time to develop relationships with local bodies and communities to ensure the distribution of aid. All of these factors contribute to the low levels of disaster aid provided to micro enterprises and their frequent failure following a disaster.

This research proposes a bottom-up 'ex-ante' approach to building capacity at the local level by focusing on learning, awareness, and creating social capital through supply chain linkages. During a disruption, this social capital can be accessed and can facilitate the flow of information and material that, in turn, can help micro enterprises to survive at such times. Based on the model presented in Figure 1, a four-step proactive approach to disaster resiliency is proposed, which HOCM agents, NGOs, micro enterprises, and other interested parties can employ.

Step 1: conduct an assessment of the likelihood of failure of a micro enterprise in the event of a disaster

The first step is to assess the vulnerability of a micro enterprise to disruptions in the supply chain that can occur post disaster. Some questions to ask at this point are: how many employees will be affected by the disruption? Does the owner belong to a vulnerable social group (and, therefore, will be more affected by the disaster)? Is the owner literate? Does the owner have access to or utilise elements of the formal economy, such as bank accounts? What capacity does the micro enterprise have in terms of, inter alia, financial resources, cash flow, firm orders, and inventory of raw materials? The answers to these questions, along with an examination of financial outcomes (profitability and sales growth), operational outcomes (quality, flexibility, and the ability to accommodate customers' special requests), and time-based outcomes (delivery speed and reliability, new product development time, production lead time, and swiftness of response to customers) before and after a disaster, would aid an evaluation

of the resilience capability of a micro enterprise. If the assessment indicates that the micro enterprise is weak, then it is likely to fail in the event of a disaster. Steps 2–4 will help the micro enterprise to become stronger and improve performance significantly following a disaster, ensuring its survival.

Step 2: build resilience through cognitive preparation for supply chain disruptions

The second step involves appraising the degree of cognitive preparation. Some questions to ask at this point are: to what extent do micro enterprise owners recognise that supply chain disruptions are always looming? Do owners periodically think about how a supply chain disruption could have been avoided in the past? After a disruption has occurred, has the situation been analysed thoroughly and have new ways of helping the micro enterprise cope with future disruptions been identified? If the level of preparation is insufficient, micro enterprise owners can be trained in new ways of thinking that can help them in the future. For example, owners can be trained to identify areas of improvement in their processes, and to develop techniques that can assist them in dealing with future disruptions.

Step 3: build resilience by learning from experience of disasters

The third step involves gauging the degree of learning from past disasters. Some questions to ask at this point are: to what extent do micro enterprise owners reflect on information on previous disruptions? How much learning actually occurs after a supply chain disruption? How do micro enterprises ensure that this critical knowledge is shared, documented, and reinforced within their informal network? Micro entrepreneurs need to be encouraged with regard to their questioning, self-reflection, and information-seeking as it pertains to supply chain disruptions in post-disaster scenarios. Micro enterprises should also be trained to filter the information acquired, because information often is ambiguous in post-disaster environments. Furthermore, there is a natural tendency to forget lessons learned from disaster-related supply chain disruptions; HOCM agents potentially could set up training programmes and learning centres to help owners filter information and to ensure that knowledge is shared with the local community.

Step 4: build resilience through social capital

The fourth and final step is to assess the level of social capital a micro enterprise possesses within its supply chain and how it can be augmented. Social capital can be determined by examining the levels of supply chain integration and coordination, long-term orientation, and supply chain interaction and communication. Some questions to ask at this point are: what is the size and density of the supply chain network? To what extent do micro entrepreneurs share common values with the members of their network? To what extent does the micro entrepreneur share a

common language with members of the network? What is the level of trust and cooperation between the micro entrepreneur and his or her supply chain network? Micro enterprises can be provided with opportunities to develop social capital by encouraging the formation of cooperative groups and providing access to them. Such access and opportunities for interaction are important; interaction through group activity can be a means of overcoming many common problems, and it can help micro enterprises to draw on informal networks to facilitate marketing and borrowing. Over time, these groups can help in establishing network ties and building trust, norms of cooperation, and stable and durable relationships.

HOCM agents can promote this four-step proactive approach to disaster resiliency. Such an approach potentially could be a more productive use of scare resources than traditional, top-down 'ex-post' interventions, especially for the informal sector. Given the minimal investment in disaster mitigation and preparedness in developing countries, it is likely that the proposed model actually will reduce the total cost of recovery (Altay et al., 2013). In addition, accompanied by a learning strategy, the total cost of recovery should fall over time and help to 'insure' a larger number of micro enterprises against the effects of a disaster (Altay et al., 2013). Since the informal sector contributes to the livelihood of a large segment of a developing country's population, the proposed model would have the effect of 'insuring' vulnerable communities against disasters.

Fundamentally, the proposed model is an 'ex-ante' approach to disaster mitigation. Rather than waiting for a disaster to occur and then expending resources, funds could be channelled in a more a productive fashion, notably by investing in resilience-building by developing capabilities to discern supply chain disruptions, learning from experience, and building social capital. Such resilience should not only be important at a time of disaster, but also potentially should strengthen micro enterprises in normal periods. Correspondingly, such an 'ex-ante' approach couples development intervention and disaster mitigation.

Conclusion

Micro enterprises operating in the informal sector of the developing world tend to be vulnerable to the effects of a disaster, and have a high probability of failure. Many owners of micro enterprises belong to marginalised communities and groups. In an 'ex-post' scenario, such entrepreneurs are unable to access the aid provided to the formal sector of the economy in a top-down centralised way. Micro entrepreneurs lack the connections, communications capacity, documentation, and confidence to join the formal sector in order to receive aid.

Based on an extensive literature review and archival data, the study model proposes that the vulnerability of micro enterprises to disaster-related supply chain disruptions can be decreased by building resilience capability. This can be achieved through a high level of awareness and attentiveness to the potential disruptive effects of a disaster,

learning from past disruptions, and tapping in to various forms of social capital, including structural, cognitive, and relational social capital.

This study recognises the value of the centralised, top-down approach deployed by HOCM and government agencies in providing 'ex-post' support to the formal sector and rebuilding the physical infrastructure in the event of a disaster. In the future it would be interesting to explore the interaction between the centralised top-down approach for formal sector reconstruction and the proposed 'ex-ante' bottom-up distributed model. The two forms of intervention will need to work in tandem. The model developed here is based on data from India. Since India might exhibit some different characteristics relative to other developing countries, such as size and the professionalism of the administrative sector (governmental or NGO), future research might want to examine the applicability of the proposed model relative to countries such as Haiti, Nepal, or even the Democratic Republic of the Congo.

Researchers might also explore how micro enterprises can increase the size and density of their supply chain network, build a common sense of purpose, values, and language among supply chain partners, and ensure that these linkages are strong enough to create resilience to disasters. A cooperative structure could promote integration and coordination with supply chain partners (suppliers, customers, and other organisations in the network) in critical activities. Long-term relationships with direct supply chain partners can be influenced by the selection of those partners as well as by family or kinship ties. Micro enterprises, because of their small size, might be at a perceived disadvantage when trying to secure information from and the cooperation of larger supply chain partners. However, careful development of interaction mechanisms through a cooperative network can result in the formation of strong ties with both direct and indirect supply chain partners, yielding a flow of information and resources to micro enterprises that can be vital to their survival during a disaster.

The model was developed and grounded by synthesising the literature and using archival documents from humanitarian relief efforts in India. For precision, it would be of value to test the model in the field using quantitative methodologies. Specifically, the constructs created can be used to establish items on scales that can gauge the degree to which a micro enterprise is vulnerable to a disaster, as well as its reliance capability, cognitive preparation, ability to learn, and social capital stock. The relationships (strength, direction, paths) among the constructs can be clearly defined. Such field research can determine how a micro enterprise's levels of cognitive preparation, learning from experience, and social capital influence its resilience capability. Even more important, the field research can evaluate the extent to which resilience capability can influence micro enterprise survival in a time of disaster by comparing pre- and post-disaster financial, operational, and time-based performance measures for micro enterprises with strong and weak resilience capabilities. Such research would also help in evaluating the efficacy of the four-step proactive approach and encourage its implementation. Finally, given the 'ex-ante' prescription, connections with developmental sector research would be of value. For instance, additional constructs from project management (project size, project goals, resource availability,

infrastructure, stakeholder variance, organisational flexibility, interactions, communication, and networking with local communities and organisations) in the developmental sector (Prasad et al., 2013) might be incorporated in future empirical studies.

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