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Entrepreneurial Clusters and Knowledge Spillovers in North-East India: A Regional Innovation Perspective

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Abstract: The study puts forward a conceptual analysis of place-based or clustered growth of entrepreneurship activities as an integral determinant of a sound entrepreneurial ecosystem. These clusters lead to information diffusion of social and cultural capital due to spatial proximity. Based on an exploratory research technique, the study talks about entrepreneurial innovations resulting from cooperation and knowledge transfers in clusters. Taking a cue from the Knowledge Spillover Theory of Entrepreneurship (KSTE), entrepreneurial clusters as sources of knowledge spillover, as well as the spinoffs, are discussed in the paper. An understanding of industrial clusters across traditional handlooms, agricultural and food products, etc., in the North-East Region (NER) of India has also been attempted here. History and available literature reiterate the concept of the existence of regionalisation, more so in a developing economy. Therefore, the paper provides a conceptual overview of the variation that exists across developed and developing economies with regard to entrepreneurial ecosystem, clusters and knowledge flow.

Keywords: Entrepreneurial Ecosystem, Entrepreneurial Clusters, Knowledge Spillover, Spinoff, Information Diffusion, Spatial Proximity.

1. Introduction

Earlier works on spatial economics (Thünen, 1826) focused on optimal spatial resource allocation theories, but with Krugman's (1991) work, the interest shifted to agglomerations due to industrial clusters and their associated benefits. While the general theory of location and space economy primarily concentrates on the geographic distribution of inputs and outputs (Isard, 1949), the New Economic Geography theory unfolds the concepts of agglomeration by combining trade costs with scale economies (Davidson & Mariev, 2015). The concept of spatial clustering is the core of economic geography research, which brings forth concepts such as proximity, place, and milieu (Malmberg & Maskell, 2002). Johannisson (2017) also stressed that geography is integral to a support system because most support structures are organised spatially, and personal networking is geographically concentrated.

The existence of clusters can be traced back to the Industrial Revolution, for instance, silk in China and trade services in the cities of the Hanse (Rocha, 2004). Earlier theories on clusters emphasised the resource-based clustering concept (Ohlin, 1933). The Absolute Advantage theory of Adam Smith (1976) was one of the earliest theories related to economic specialization between firms, regions, and countries (Garanti, 2013). Marshall (1890) presented a study analysing industrial districts in England and used the term 'industrial districts' to refer to the firms of a similar nature located in concentration and that generated economies of scale. Newer studies and works in the domain of clusters re-emerged in the 1970s (Horvath, 1970; Borukhov, 1975; Czamanski & Czamanski, 1977; Czamanski & de Abas, 1979; Becattini, 1979). Due to significant changes in the global external environment, which led to a serious crisis of the then prevalent mass production organisational model, there has been a shift of emphasis from independently operated firms to regional network-based systems, that is, clusters (Rocha, 2004). In the literature on economic geography, there are studies on the geographical agglomerations of organisations that are considered products of several environmental factors, such as the historical development of their institutional environments, policies, regional path dependencies, or industry dynamics (Porter, 1990; Markusen, 1996; Paniccia,



1998). Becattini (1990) also used the term 'industrial districts' in his work, where it was defined as a "socio-territorial entity which is characterised by the active presence of both a community of people and a population of firms in one naturally and historically bounded area" (p. 38). Thus, globalisation, accompanied by specialisation, leads to a spatial concentration of activities (Dunning, 2000). With the progression of cluster theory, the concepts of managed or organised clusters have also surfaced in the literature (Sölvell et al., 2003), which are similar to formal organisations in terms of membership, monitoring, rules, sanctions, and hierarchy (Lupova-Henry et al., 2021).

While entrepreneurial spillovers are considered the outcome of cluster-based development, the resultant effect of such spillovers may not be the same for all economies. This study attempts to recognise the contextual differences in which entrepreneurial ecosystems work across global developmental parameters. Since little is known from a developing country's perspective, the paper identifies such gaps in the literature across developed parameters and focuses on the cluster practices that have led to regional entrepreneurship growth. Therefore, to fill this gap in the existing literature, this study provides an understanding of the differences that exist in the entrepreneurship ecosystems of developed and developing economies.

The North East Region (NER) of India suffers from entrepreneurial backwardness endemic to the region and the youth. Despite aggressive state intervention in entrepreneurship development in the region in the form of subsidies and duty exemptions, the take-off is relatively slow compared to other states. Cluster concentration is visible in traditional products and handlooms of the region, which are the result of the activities of skilled artisans. However, there is a dearth of sufficient published works in Scopus or Web of Science (WoS) sources on industrial clusters of the North-eastern states. Against this backdrop, the effects of spatial proximity in the local clusters of the NER lack concrete theorization and critical thinking, and as a result, the knowledge remains localized. This paper, therefore, by building on the Knowledge Spillover Theory of Entrepreneurship (KSTE), attempts to establish a theoretical understanding of spatial clusters across eight states in the region. By extending the discussion to the region, this study helps examine how abstract theoretical constructs manifest within a geographically and institutionally constrained entrepreneurial ecosystem. Moreover, this study examines the dynamics of the interaction between locally embedded knowledge systems and policy-induced clusters in the NER.

In other words, this study aims to address the Research Questions (RQ) stated below:

RQ (a): How do the various actors in the entrepreneurial ecosystem interact in developed and developing economies?

RQ (b): What are the roles of institutionally devised clustering policy and traditional regional clusters in the NER of India in generating knowledge, innovation and socio-economic spillover?

2. Method

This study puts forward the concepts and existing works on spatial clusters and their resultant spillovers. It follows a conceptual research design and uses existing theories and contextual analysis for an in-depth interpretive study as well as for articulating newer perspectives (Astrini et al., 2025). This study adopts a semi-systematic literature review approach suitable for providing an overview of the research theme and understanding the state of knowledge in the domain (Snyder, 2019). Thus, it is exploratory in nature and is based on an extensive literature review to obtain a thorough outline of how clusters foster entrepreneurship in a region. Secondary and published data were used to understand the strategic importance of spatial clusters in the entrepreneurial ecosystem. Relevant documents from Scopus-indexed journals and widely accepted publisher sources such as Elsevier, Sage, Springer, and Taylor & Francis, along with government policy documents, were considered for a conceptual depth on the role of regionalism in entrepreneurial information and knowledge generation. The search strategy comprised keywords like "entrepreneurial clusters", "knowledge spillover", "spatial proximity", "industrial clusters", and "entrepreneurial innovation in clusters".

For a context-specific assessment of the NER, documentary analysis has been employed as a complementary method. As a significant qualitative research method, documentary analysis facilitates the review of institutional reports and statements (Bowen, 2009), thus enabling a deeper understanding of policy intervention shaping cluster



dynamics in the region. The clusters considered for this study are not intended to be exhaustive but are based on the available literature, policy documentation, accessible data, and sectoral relevance.

The industrial clusters of the NER considered in this study have aided in illustrating the KSTE in the regional context as well as in policy-relevant areas. The clusters were identified based on the available reports of the Scheme of Fund for Regeneration of Traditional Industries (SFURTI) published by the Ministry of Micro, Small & Medium Enterprises (MSME), and Government of India. This scheme has been considered as it is aimed at the cluster-based development of traditional and rural artisans and provides a structured policy framework for necessary intervention (Ministry of Micro, Small & Medium Enterprises, 2022). Therefore, considering data from SFURTI is appropriate for this study, as it provides systematically documented evidence of institutional support and capacity-building initiatives undertaken by the Ministry of MSME in regional industrial clusters. The available list of functional clusters in the NER till the year 2021-22 was considered for this study. This list is used as an illustration of the sectoral classification and the training authorities present in the region in recent years. The industrial clusters reported in this work, apart from being present in the Ministry database, also represent the indigenous knowledge that has existed in the region for generations (such as handlooms and handicrafts).

However, the limitations of using published works from this source must be acknowledged. Being a centrally administered policy intervention, the scheme (SFURTI) may constrain local innovation and the indigenous knowledge of local artisans. Although the reports provide data on tangible elements such as capacity building and infrastructural development, there is a lack of clarity regarding intangible outputs such as knowledge flow and innovation spillover in the region. As such, these aspects require critical analysis and proper documentation, as attempted in this study.

3. Theoretical Background on Industrial Clusters

Marshall (1890) considered proximity as a prerequisite for the emergence of industrial districts. The most widely accepted definition of a cluster is a geographically proximate group of firms and associated institutions in related industries linked by economic and social interdependence (Porter, 1998). According to the Europe InnoCluster Mapping Project (2008), clusters are co-locations of business partners and educational and research institutions related through varied linkages. To summarise in table 1, several authors have defined clusters based on different key aspects, such as:

Table 1. Defining clusters by various authors

| Author(s) | Keywords used for defining clusters |
|---|---|
| Marshall (1890); Arthur (1990); Sorenson and Audia (2000) | geographical proximity |
| Porter (1990, 1998); Rosenfeld (1997) | geographical proximity, interdependence |
| Krugman (1991); Waits (2000) | geographical concentration |
| Tushman and Rosenkopf (1992); Wade (1995) | firms linked due to same core technology |
| Saxenian (1994) | geographical boundaries |
| Schmitz (1995) | collection of related industries, production of specific type of product or service |
| McCann (2001) | place specific increasing returns to scale |
| Rocha and Sternberg (2005) | geographical proximity, inter-firm network and inter-organisational network |
| Stough (2006) | geographically concentrated, interdependent, functionally interrelated |
| Garanti (2013) | geographical proximity, commonalities & complementarities |
| Namyślak and Spallek (2021) | links of complementarity of entities located in close proximity |

Source: Author's own compilation

Garanti (2013) defines a cluster as a "geographically proximate group of interconnected companies and associated institutions in a specific field based on commonalities and complementarities" (p. 23). Clusters comprise



institutes linked through multiple linkages and spillovers (The High Level Advisory Group on Clusters, 2007). According to Sölvell *et al.* (2003), clusters are a summation of five crucial actors: co-located and linked industries, government, academia, finance, and institutions for collaboration. Regional clusters are found in several categories like high technology industry agglomerations such as the Silicon Valley; industries that require high levels of craftsmanship, such as the Venetian glass industry, the Japanese cutlery industry; traditional, low technology industries, such as the clusters in footwear, garments, toys, and plastic products in South China; fashion industries centered on Paris, Milan, and New York; the auto industries of Japan, Germany, and Sweden; the electronics industries of Japan, Taiwan, and the United States; knowledge-intensive professional and financial service centres of New York, London, Tokyo, and Hong Kong (Enright, 2003).

3.1 Entrepreneurial Innovation and Knowledge Creation from Clusters

Clusters are considered to contribute towards economic growth, employment generation, export growth, innovation and entrepreneurship (Waits 2000; Rocha & Sternberg, 2005; Delgado *et al.*, 2010). Fingleton *et al.* (2004) are also of the opinion that cluster intensity results in employment growth. Porter's works on clusters (1990; 1998) established the competitive dimension of clusters. Further studies (OECD, 1999) came forward with the theories of innovation from clusters. Audretsch and Feldman (1996) consider knowledge spillovers as an outcome of innovative activities and that they are spatially concentrated. Furthermore, with enhanced innovative activities, clustering also increases patenting (Delgado & Porter, 2014). There exists a reciprocal relationship between clusters and entrepreneurship. With the growth of clusters, entrepreneurship in the region thrives. Also, clusters are, at times, driven by collective newer start-ups which are endeavours of entrepreneurs with experiences in the same industry (Karlsson, 2008). The idea of clustering is based on personal interactions, opportunity to communicate and create together (Lines & Monypenny, 2006). Both cooperation and competition exist in clusters. The network component of clusters is a crucial element as it assists in the generation and sustenance of economic and non-economic resources (Rocha & Sternberg, 2005). Moreover, the technology and knowledge spillovers from these clusters also add value to the region. The ripple effect can also be felt in the economy as a whole with major policy modifications, increased innovation and enhanced business activities. As such, the cluster environment boosts the competitiveness of the firms as a result of enhanced innovation, interaction, collaboration and increased efficiency (Kassalis, 2011).

As globalisation boosts innovation, the result is clustering of economic activities to avail the benefits of innovation. Proximity is a prime element that results in relationship building among firms that stimulate the exchange of knowledge and information. This also triggers learning and innovation. Innovation activities tend to be localised and cluster around regions that provide a cordial environment for innovation (Johansson *et al.*, 2006). When highly innovative technology-based ventures cluster locally, it is termed as innovation milieu (Aydalot, 1986; Aydalot & Keeble, 1988). These milieus are the outcome of cooperation and knowledge transfer, leading to the development of innovative capacity and synergies. Knowledge diffusion in the innovation milieu takes place through the movement of labour, inter-firm networks, collaborations with industry or channel partners, and spin-offs from existing firms, universities, or research laboratories (Keeble & Wilkinson, 1999). It is a known fact that the process of knowledge creation requires investment in education and research and development. The initial investment can be balanced in clusters since the co-location phenomenon reduces the cost of interaction as the expenses related to searching, identifying and transferring knowledge are reduced to a great extent (Malmberg & Maskell, 2002). With the creation and use of knowledge, the economic activities prosper, leading to the creation of economies for the cluster. As such, the sustainability of clusters depends upon the ease of knowledge creation and dissemination through interaction. In other words, the pervasiveness of knowledge externalities is one of the prime reasons behind the success and existence of clusters (Baptista & Swann, 1998).

3.2. Knowledge Spillover Theory of Entrepreneurship

Marshal considers knowledge and information spillovers as non-pecuniary externalities that will get transferred due to intensive face-to-face interaction or conscious mutual information exchange within the cluster environment (Karlsson, 2008). "The spillover phenomenon refers to inter-firm externalities that can generate incremental as well as more radical innovations concerning firm routines and product attributes" (Johansson, 2006) (p. 137). Localised knowledge spillovers facilitate companies working within the arm's length to introduce innovations



at a faster rate (Breschi & Lissoni, 2001). Spillover can be regarded as a cumulative process when knowledge and resources are combined to generate more knowledge that gets transferred to the research community, which results in the creation of enhanced knowledge (Baptista & Swann, 1998). A crucial matter of fact is that the knowledge that spills over is a public good that can be freely used by anyone interested; however, this knowledge, being highly contextual, can be transmitted only through close contacts that require spatial proximity (Breschi & Lissoni, 2001). This phenomenon also holds for high technological or other extremely specialised clusters. Due to the uncoded nature of the technical knowledge, the flow is smooth only locally, rather than outside the spatial boundary. This is in line with the work of Audretsch (1998), which states that the propensity of innovation to be clustered is high when the knowledge is tacit, which requires direct, informal and repeated contacts to be transmitted. Aligned with this, though, is the study by Jaffe (1986), according to whom the transport mechanism of tacit knowledge is informal conversation, which is why geographical proximity is essential to benefit from spillovers. Thus, it is not only skills that help in capturing and transforming knowledge into economic knowledge but also local proximity to the knowledge source (Acs *et al.*, 2013).

Entrepreneurship has been observed to vary across geographic space and scales (Reynolds *et al.*, 1994; Trettin & Welter, 2011). That knowledge spillovers form the basis for new entrepreneurial ventures is the core proposition of the Knowledge Spillover Theory of Entrepreneurship (KSTE) (Audretsch, 1995). The theory puts forward that individuals perceive opportunities from the knowledge available in the surrounding environment. The context of decision-making is considered crucial, and hence, a context with abundant knowledge serves as a seedbed for exploring newer entrepreneurial opportunities. Braraunerhjelm *et al.* (2010) claimed that entrepreneurs are one missing link in converting knowledge into economically relevant knowledge and relevant growth. When individuals initiate commercial endeavours with knowledge evolving from existing firms, in that case, they act as a bridge between the knowledge that has spilled-over, entrepreneurship activities and enhanced economic performance (Acs *et al.*, 2009). Incumbent firms, research institutes, universities and similar other organisations are considered as sources of the knowledge that remains unutilised and underexploited and therefore, diffuses to economic agents like entrepreneurs (Acs *et al.*, 2013). If spillover sources are located in the neighbourhood, it is easier for the prospects to capture and capitalise on the knowledge. Therefore, it is likely that the new start-up from the spillover knowledge is spatially located within the geographical proximity to the actual knowledge source (Audretsch *et al.*, 2006). The applicability of this theory in the context of the industrial clusters of the NER is discussed in the following sections.

4. Entrepreneurial Ecosystem, Clusters and Knowledge Flow: Developed Vs. Developing Economy

The literature suggests the functioning, spillover and spin-offs of clusters in developed countries with a built-in infrastructure. It is evident from the studies and the empirical evidence supporting the KSTE for the different contexts provided by industry specific knowledge investments that exist in the developed economies, showcasing the German, Swedish, Japanese, Austrian, Italian and Australian experience (Audretsch & Lehmann, 2005; Anselin *et al.*, 1997; Bode, 2004; Fritsch, 1997; Bania *et al.*, 1993; Stephan, 2001; Abbot & Doucouliagos, 2003; Amano, 1997; Chiesa & Piccaluga, 2000). There is little evidence that the theory will hold in regional contexts across levels of economic development. This section attempts to identify the various actors and their roles in entrepreneurial ecosystems of developed and developing economies in accordance with RQ (a).

Entrepreneurial outcomes vary across regions since the ecosystem structures are distinctive (Audretsch *et al.*, 2025), and so there exists variation in the entrepreneurial knowledge agglomeration in the developed vis-a-vis developing country system. Entrepreneurship can have substantially different meanings, goals, and manifestations outside the industrialised West. While in the developed world, higher education entrepreneurship is associated with knowledge production for economic development, but in developing nations like those in Chilean universities, researches are expressed in scholarly publications, not in patents or profit (Bernasconi, 2005). Previous studies have stressed the existence of interaction between government, universities and innovation model in the entrepreneurship ecosystem (Kumar *et al.*, 2024), but it remains context-neutral since there is no distinction made with regard to developed and developing economies. However, studies have also emphasised that the clusters of the developed countries, though not identical, operate at the same level of technological sophistication, worker qualification and



management competence, but those in the developing nations are initially formed as mere spatial agglomerations due to survival needs or urbanisation (Van Dijk & Sverrisson, 2003).

Figure 1 represents an interpretive model that attempts to provide a conceptual understanding of the existing differences in the entrepreneurial ecosystems of developed and developing economies.

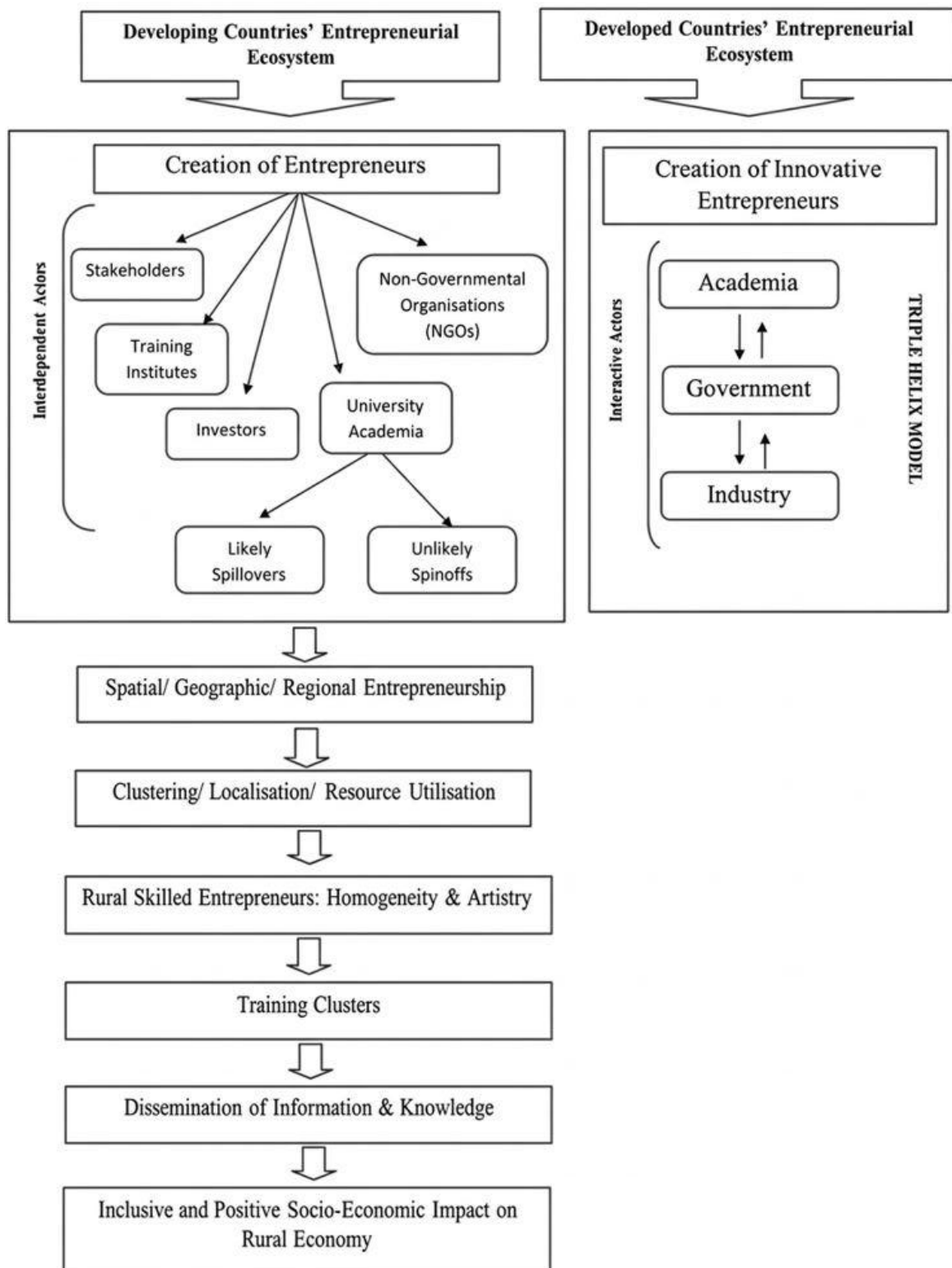


Figure 1. Typology of Entrepreneurial Ecosystem: Variants across Economies

The Triple Helix model of innovation (Etzkowitz & Leydesdorff, 2000) that combines three dimensions of academia, industry and government as interacting actors for the creation of a knowledge-based society, holds for



developed economies. This is because the efficacy of the model depends on the presence of a well-coordinated and organised innovation system (Cai & Amaral, 2021), which can be found mostly in advanced nations. The resultant outcome of these interactive actors is the generation of innovative entrepreneurs, such as likely spin-offs and spillovers in the ecosystem. In contrast, the operationalisation of the model in an emerging economy is hindered by bureaucratic rigidity, fund crunch, cultural gaps and limited innovation (Astrini et al., 2025). The model is also found to become unbalanced in a developing economy setting due to more authority of the government and limited autonomy of Universities (Saad & Zawdie, 2011). It is important to note that Figure 1 holds for developing economies where linkages between industry, government and academia are not strong enough for smooth innovation diffusion. On the other hand, from the perspective of the developed nations, the applicability of the proposed theory in Figure 1 depends on the efficacy of the Triplex Helix model as mentioned above.

An EE in an emerging economy is quite a departure from the Western 'Silicon Valley' model. This is with regard to the R&D, high-tech patents and university-industry linkages present in the advanced industrial districts, whereas the ecosystems in a developing setting are characterised by institutional voids and informal networks (Giuliani & Pietrobelli, 2011). This means, clusters in emerging economies have fragmented networks and lack dense inter-firm linkages. Further, the main determinants of cluster performance in developing economies are found to be: density of networks, presence of informal channels for knowledge flow and macro-policy environment/ government interventions (Rawat et al., 2017).

It has also been previously discussed that the areas in geographical proximity to universities tend to have access to ideas and information deliberated within the premises and hence, Universities act as a source of knowledge spillovers contributing to regional growth (Acs et al., 2013; Hayter, 2016). Though Audretsch & Belitski (2021) have forwarded the Three-ring entrepreneurial university model, the new knowledge commercialisation is yet a proposition not taken off well in the developing world. As such, the coexistence of universities, entrepreneurship institutes and entrepreneurial incubators requires strategic positioning for the creation of entrepreneurship in a developing society. In a developing nation setting, there are interdependent factors in the entrepreneurial ecosystem, as in Figure 1 above.

While knowledge spillovers are quite likely in developing economies as well, since the areas in proximity to universities get access to the knowledge component, spin-offs from universities are unlikely due to lesser entrepreneurial activities and presence of financial, institutional and information barriers of innovation (Pachouri & Sharma, 2016). Further, with the interaction of actors like the stakeholders, training institutes, investors, NGOs and the academia, the resultant outcome is regional entrepreneurship in the form of clusters, which are primarily rural-based, artistic and homogeneous industries. This is supported by the study by OECD (2021), which identifies entrepreneurship firms, anchor institutes (universities and knowledge parks), regulatory bodies, financial bodies and other intermediaries (mentors, consultants, incubators, etc.) as prime actors of the entrepreneurship ecosystem in a developing nation like Thailand. With the intervention of authorised training and development institutes, these indigenous industries are organised into training clusters, which again leads to information dissemination towards an inclusive and positive socio-economic impact. When economic foundations like regulations, finance and knowledge are devised to support cluster needs, the competitive performance of businesses gears up to a higher performance level (Porter, 1990). This has been further elaborated in the context of India's NER in the section below.

5. Entrepreneurial clusters: The scenario in India and its North-Eastern Region (NER)

The cluster formation of the region is due to the presence of both top-down and bottom-up approaches, where the pattern of knowledge flow is different in both. As a policy-driven (top-down) initiative, the Government of India has been making several efforts to assist the indigenous industries to retain their ingenuity and competitiveness in the market. In this regard, the Scheme of Fund for Regeneration of Traditional Industries (SFURTI) was launched in 2005 by the Ministry of MSME, Government of India. The Scheme aims to organise traditional artisans and group them into clusters for better governance and sustainable development. Indian Institute of Entrepreneurship Guwahati (IIEG) is one of the nodal agencies responsible for identifying and developing clusters across the North Eastern Region (NER) of the country. Table 2 depicts specific spatial clusters in the states of North East India that explore and include local resources for entrepreneurial development. These clusters are mostly agro-forest dominant and are concentrated around handloom, handicrafts, bamboo, organic fertilizers and food processing, including locally



grown and available items like tea, honey, pineapple, mushroom, turmeric, ginger, moringa, etc. As a result, these clusters are prominently resource-based and community-driven. This section attempts to analyse the roles of both institutionally devised and traditional clusters of the NER, in accordance with the RQ (b).

Table 2. Entrepreneurial clusters in North East India

| Indian States | Products | Entrepreneurial Product Cluster | District/Area | Entrepreneurial Training Provider | |
|-------------------------|---|--|-----------------|-----------------------------------|-----|
| Arunachal Pradesh | Aloe Vera, Turmeric, Moringa and Mushroom Value addition | Aloe Vera, Turmeric Moring and Mushroom Value Addition Cluster | Namsai | PPDC Agra | |
| | Handloom | Eri Silk Cluster | East Siang | IIE | |
| | | Handloom & Traditional Dress Making Cluster | Lower Subansiri | KVIC | |
| Assam | Agro Processing | Agro Cluster | Kamrup | IIE | |
| | | Agro Processing Cluster | Bongaigaon | | |
| | Food Processing | Organic Green Tea Cluster | Dibrugarh | | IIE |
| | | Tea Cluster | Sonitpur | | |
| | Handicraft | Brass Metal Traditional Mini Cluster | Barpeta | COHANDS | |
| | | Brass Metal Cluster | Kamrup | | |
| | | Terracota Cluster | Dhubri | | |
| | | Handicraft Endi Silk Diversified Handloom Cluster | Jorhat | | |
| | | Sitalpati Cluster | Goalpara | | |
| | | Dress Making & Handicraft Cluster | Goalpara | | |
| | Handloom | Silk Cluster | Nagaon | IIE | |
| | | Artistic Textiles Cluster | Kamrup | | |
| | | Textiles Cluster | Kokrajhar | | |
| | | Silk Cluster | Lakhimpur | | |
| | | Endi Silk Diversified Mini Cluster | Baksa | | |
| | | Diversified Mini Cluster | Kamrup | | |
| | | Textiles Cluster | Marigaon | | |
| | | Weaving & RMG Cluster | Dibrugarh | | |
| | | Traditional Dress Making & Embroidery Cluster | Darrang | | |
| | | Traditional Dress Making and Weaving Cluster | Barpeta | | |
| Pottery craft | Pottery Cluster | Golaghat | PPDC Agra | | |
| Manipur | Agro | Agro Cluster | Churachandpur | IIE | |
| | Cane processing and furniture making | Cane and Bamboo Furniture Making and Cane Processing Cluster | Imphal East | PPDC Agra | |
| | Food Processing and Pineapple Processing and Value addition | Pineapple Processing | Imphal East | | |
| | Handicraft | Cane & Bamboo Cluster | Chandel | IIE | |
| | | Cane & Bamboo Furniture & Utility Product Cluster | Tamenglong | | |
| Handloom and Handicraft | Handloom & Handicraft Cluster | Tamenglong | | | |



| | | | | |
|------------------|---|--|-----------------|-----------|
| | Honey Processing and Vermi- composting | Honey Processing and Vermicomposting Cluster | Thoubal | PPDC Agra |
| | Kauna Processing | Kauna Processing Cluster | Imphal East | |
| | Medicinal & Essential Oils | Aromatic Cluster | Churachandpur | IMEDF |
| | Medicinal herbs extraction unit with associated production | Medicinal Herbs Extraction Unit with Associated Production Cluster | Ukhrul | PPDC Agra |
| | Mekhala, ladies Shawls, Bed sheet, Ladies Blouse, Carpet and other Embroidery items | Traditional Embroidery Cluster | Thoubal | KVIC |
| | NTFP | Reed Cluster | Imphal East | |
| | Textile and Garments Products | Woven Textile and Garment Manufacturing Cluster | Imphal West | IIE |
| | Wood Based Furniture | Wood Based Furniture Cluster | Imphal East | PPDC Agra |
| | Wood Carving and Carpentry | Wood Carving and Carpentry Cluster | Imphal West | |
| Meghalaya | Handicraft | Cane & Bamboo Cluster | West Garo Hills | IIE |
| Mizoram | Agro Processing | Reiek Multi Farming Cluster | Mamit | KVIC |
| | | Agribusiness Cluster | Kiphire | IMEDF |
| Nagaland | Cane & bamboo processing, furniture Making | Cane & Bamboo Processing and Furniture Making Cluster | Zunheboto | PPDC Agra |
| | Food Processing | Pineapple Processing and Value Addition Cluster Nagaland | Mokokchung | |
| | | Turmeric, Ginger and Moringa Processing Cluster | Zunheboto | |
| | Handloom and Handicraft | Bamboo & Textiles Cluster | Dimapur | IIE |
| Sikkim | Enrich & Vermicompost | Enriched Composting/ Vermicomposting Cluster | West Sikkim | FMC |
| | Food processing | Sumbuk Shitake Mushroom & Other Food Processing Cluster | South Sikkim | KVIC |
| | | Shiitake Mushroom & Other Food Processing Cluster | West Sikkim | |
| Tripura | Bamboo | Bamboo Mat Cluster | West Tripura | IIE |

Note: Khadi and Village Industries Commission (KVIC) is a nodal agency in India for the development of rural-based industries in remote areas. Indian Institute of Entrepreneurship(IIE) is an agency for guiding the entrepreneurs in training and facilitation, Process and Product Development Centre (PPDC) was set up for technological up-gradation of small industries, Indian Micro Enterprises Development Foundation (IMEDF) is social enterprise development organization set up to boost an ecosystem for green and inclusive entrepreneurship, Council of Handicrafts Development Corporations (COHANDS) is a organization for development of handicrafts. Foundation for MSME Clusters (FMC) is an agency specialising in the promotion of MSMEs through clusters.

Source: Ministry of Micro, Small & Medium Enterprises (2022)

The entrepreneurial ecosystem components are visible from the interaction of the actor's active in each product development. They can also be termed as the training clusters and agglomerations, which coexist as congregations of various small-sized enterprises. The IIEG, KVIC and the COHANDS, being the nodal agencies of SFURTI, engage in overall supervision and appraisal. The training institutes equip the local artisans with the necessary skills and modern tools, and thus increase their competitiveness. The IIE has developed over 54 clusters in the whole of North-East India and has successfully benefitted around 2200 artisans belonging to marginalised communities



([Indian Institute of Entrepreneurship, 2024-2025](#)). The bamboo and cane cluster of Assam has resulted in direct employment in the rural areas, as well as reported increase in income levels of the craftsmen ([Patir, 2021](#)), thus indicating economic spillover in the region. Analysing through the lens of the KSTE, the collective environment under the scheme enables knowledge exchange among the artisans through institutionally mediated interactions. Innovation diffusion is evident from design diversification and skill upgradation by providing modern machinery at the ready-made garment weaving cluster in Moran, Assam ([Export Promotion Council for Handicrafts, 2021](#)). SFURTI also facilitate market-oriented innovation by capacity building and developing market linkages, thus enabling entrepreneurial activity in accordance with the KSTE, in the form of micro and small enterprises.

The training initiatives under SFRUTI focus on capacity building, which is expected to further enrich the craftsmanship of the artisans to meet the global standards. On the contrary, a case study on the Bamboo Craft Cluster in Barpeta, Assam, conducted by [Das \(2016\)](#) reveals that the Common Facility Centre (CFC) under SFURTI remained unused due to the disparity between the machineries used by the local artisans and the ones used at the facility. This limits the smooth flow of knowledge, and hence, the spillovers are less intensive and less embedded, which is true for a policy-driven cluster ([Dyba, 2016](#)).

The NER also exhibits the presence of indigenous locally evolved clusters that reflect a bottom-up approach of cluster formation. Products made from traditional handloom-weaving or handicraft-making skills majorly constitute organic clusters that are driven by market demand and local resources. One of the most famous clusters that existed much before formal policy making is the 'Sualkuchi Silk Cluster' of Assam, where silk weaving began around the 17th century. The knowledge flow in such organic clusters is distinguished by strong relations linking firms with dense internal networks ([Dyba, 2016](#)). Being mostly concentrated by family-oriented businesses, the knowledge flow of the skills in such clusters usually takes place by 'legitimate peripheral participation' ([Lave & Wenger, 1991](#)), where learning is participation in social practice ([Basole, 2015](#)). As such, the skill diffusion of weaving techniques of traditional motifs or designs takes place rapidly within such clusters through the already existing local and social networks, thus facilitating knowledge sharing. This is also supported by the 'Ladder model of cluster richness' ([Swann, 2009](#)), which claims that the highest stage of cluster advancement is characterised by informal knowledge exchange that is difficult to measure.

Additionally, the KSTE suggest that in the absence of local entrepreneurs, new knowledge does not necessarily lead to regional growth. This means if state-led clusters are created in a region where the locals lack technical and business skills, then the knowledge created is less likely to be commercialised. In other words, the effectiveness of the knowledge externalities arising from SFURTI clusters will depend on the 'entrepreneurial absorptive capacity' of the local entrepreneurs, which is crucial for converting knowledge to profitable avenue ([Qian & Acs, 2013](#); [Audretsch & Belitski, 2020](#)). While newer upgradations in the clusters may be institutionally infused, the skill spillover to nearby areas usually takes place through social channels. In this backdrop, the role of policy intervention in the tacit knowledge dissemination over the informal community-based network requires further evidence-based research. A striking observation made by [Pachouri and Sharma \(2016\)](#) highlighted that small and medium firms in India considered government regulatory provisions as barriers to innovation. In addition, despite the concentration of industrial clusters across the NER, the region lacks innovative industrial firms, while such firms are present in the rest of the country ([Chetia et al., 2025](#)). Thus, it can be inferred that the spillover effects of these institutionally driven clusters of the region on industrial innovation are quite minimal. Arguing in the lines of the institutional theory, the clusters are governed by the rules and expectations and the entrepreneurial activities are restricted to the pre-defined training modules and institutional policies ([Bruton et al., 2010](#)). The clusters are also bound by political lock-in, which undermines cluster creativity and innovation ([Chen et al. 2022](#)). Hence, despite acting as a facilitator in the entrepreneurial ecosystem, the effectiveness of the scheme in generating knowledge and innovation spillover depends on flexibility, adaptation to the indigenous innovation practices and acceptance of the local social networks.

6. Conclusion and Future Direction

The paper examines knowledge flow and innovation spillover from place-based clustering in developing economies, an area less discussed in the literature since cluster dynamics have mostly been found to be generalised in the developed nation's context. While the symmetric relationship between industry, government and academia is



prevalent in an advanced economy setting, entrepreneurship growth is a holistic combination of multiple interdependent actors in developing regions. Drawing on the KSTE, the study reveals that cluster economics and knowledge diffusion are mostly mediated by government policies in developing economies since the universities, here, struggle with financial, information and regulatory barriers to innovation. In such a backdrop, institutional training interventions exist that concentrate on industrial agglomerations that are localised or clustered spatially. Role of knowledge-based entrepreneurship and entrepreneurial university are the key drivers for spin-offs, which are, however, less observed in developing economies due to socio-political conflicts, poor infrastructure and economic instability. Hence, Universities being considered as local level actors of cluster creation, their role in developing nations' clusters through spillover or spin-offs needs further detailed analysis.

Extending the discussion on spillovers to the clusters of India's NER, the paper identifies the presence of a hybrid ecosystem of clusters in the NER due to the presence of both organic and policy-induced interventions. Thus, the interplay and co-existence of both local interaction and external linkages are crucial for cluster competitiveness. The state-led clusters have been found to generate entrepreneurial activity, but they also institutionalise it, thus leading to structured rather than organic innovation systems. However, the presence of community-based networks is crucial for tacit knowledge flow, and they are stronger than the formal network channels devised by a top-down approach. Moreover, beyond mere spatial proximity advantage, the success of the clusters of NER should be evaluated based on the relational network. Therefore, further study requires evaluation of the cluster policy of SFURTI using Social Network Analysis (SNA), rather than only evaluating based on the number of common facility centres or capacity building programmes. For a detailed and insightful understanding of functional dynamics and synergies from clusters of the region, case-based studies are necessary in the context of the KSTE.

Overall, the paper makes a significant theoretical contribution by exploring and developing the concept of 'spillovers from entrepreneurial clusters' from the North-east India's perspective, an area not previously critically examined in the literature before. The paper, ultimately, put forwards the argument that there is a need for context-sensitive and interaction-driven cluster ecosystems in the region, where knowledge diffusion results in innovative and sustainable spillovers and spin-offs.

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Author Contribution Statement

Aparajeeta Borkakoty: Conceptualization, Writing - Original Draft, Supervision. Saptadweepa Shandilya: Conceptualization, Methodology, Writing - Original Draft. Angana Borah: Writing-Review and Editing, Visualisation. Upasana Borpujari: Writing-Review and Editing, Resources. All the authors have read and agreed to the published version of the manuscript.



Does this article screen for similarity?

Yes

Conflict of Interest

The authors have no conflicts of interest to declare. There is also no financial interest to report. The author certifies that the submission is original work and is not under review at any other publication.

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