

Mapping Fintech Firms in Northwest City Region of Ireland: An Analysis of Linkages and Collaborations using the Triple Helix Model

Saima Karim¹, Isobel Cunningham², Laura Bradley³, Ciaran OHannrachain⁴

¹Atlantic Technological University (ATU), Letterkenny.

²Atlantic Technological University (ATU), Letterkenny.

³Ulster University Business School, Magee Campus.

⁴Atlantic Technological University (ATU), Letterkenny.

Emails: L00178253@atu.ie, Isobel.Cunningham@atu.ie, lm.bradley@ulster.ac.uk,
Ciaran.OHannrachain@atu.ie

Abstract: The Northwest City Region of Ireland is emerging as a fintech hub. It is supported by digital infrastructure, skilled talent, and access to EU and UK markets. However, the extent of collaboration among fintech actors remains unclear. This study examines how spatial and relational dynamics influence cluster development, applying Regional Innovation System theory and the Triple Helix Model. The 4I Linkage Model is adapted to assess relationship strength across intensity, importance, involvement, and investment. A mixed-method approach combines firm-level interviews, spatial mapping, and structured linkage scoring. Findings reveal strong international links but weak local collaboration. Multinational firms dominate external engagement, while smaller firms face barriers to local integration. Academic and government connections are often limited. These gaps suggest a fragmented Triple Helix system and present challenges to deeper integration. The paper offers policy and research insights to strengthen fintech cluster development through enhanced institutional coordination and hybridized roles.

Keywords: Fintech clustering, Northwest City Region(Ireland), Regional Innovation System (RIS), Triple Helix Model, Inter-Firm Collaboration.

Introduction

Fintech firms in the Northwest City Region of Ireland are growing in number and diversity. The region benefits from robust digital infrastructure, a well-educated talent pool, and cross-border access to both EU and UK markets. These structural advantages have drawn interest from both multinational enterprises (MNEs) and local startups. However, presence alone does not guarantee innovation and regional growth. Innovation is increasingly understood as a systemic, networked, and place-based phenomenon, embedded in the interactions among various actors in a region (Cooke, Uranga and Etxebarria, 1997; Asheim, Isaksen and Trippl, 2020). This paper adopts the lens of Regional Innovation Systems (RIS) to examine how fintech development in the Northwest City Region is shaped by the quality of inter-organizational linkages among firms, academic institutions, and government bodies. RIS theory emphasizes that innovation capacity is not merely the result of individual firm efforts, but is deeply influenced by regional institutional configurations, knowledge flows, and interactive learning mechanisms (Doloreux, 2002). Within this framework, strong innovation outcomes depend on how effectively regional actors co-create value, exchange knowledge, and engage in collaborative governance. At present, fintech activity in the region appears spatially concentrated but relationally fragmented. Firms operate side by side, yet many lack structured engagement with each other or with public and academic partners. This gap raises critical questions about how proximity and inter-organizational ties shape competitiveness in emerging innovation regions. Without strong relational foundations, regional growth may stall or fail to generate meaningful spillovers (Porter, 1998; Ketels, 2017). As fintech becomes more central

to Ireland's traded economy, understanding these dynamics is essential for a sustainable business environment and regional policy planning.

This study draws on the Triple Helix Model (Etzkowitz and Leydesdorff, 2000) to assess collaboration among three core institutions: industry, academia, and government in any business environment. The Triple Helix model views these spheres as interconnected and evolving for the development of any sector or region. Each contributes uniquely to regional development, industry through economic activity, academia through knowledge production, and government through regulation and support, which is the core of an evolving field like fintech. Each helix is playing a crucial role in the creation and development of fintech activities in the region. When these spheres work together, industrial clusters can develop strong institutional integration. This refers to the overlap of roles, shared goals, and hybrid structures such as innovation hubs, technology transfer offices, or regulatory sandboxes (Cai and Etzkowitz, 2020). A mature fintech region is not defined solely by the number of firms but by the quality of collaboration among these actors. The concept of role hybridization, where, for example, universities act entrepreneurially or governments co-develop policy with industry, is key to this integration. This paper uses the Triple Helix framework not descriptively, but analytically, to identify where integration is occurring and where gaps remain. To guide this analysis, the study asks: To what extent do institutional actors in the Northwest City Region of Ireland exhibit integrated collaboration, and how do these relationships shape fintech cluster development?

To operationalize this analysis, the study applies the 4I Linkage Model (Hobbs, 2010) a framework for assessing relational strength. It evaluates connections across four dimensions: intensity, importance, involvement, and investment. This structured approach provides insight into the quality of inter-institutional relationships. By grouping linkages under the Triple Helix domains of industry, academia, and government, the model provides a useful framework for evaluating the cohesion of the business environment within the industrial cluster. A mixed-methods design underpins the research. Spatial mapping visualizes the physical distribution of firms and reveals zones of concentration. Semi-structured interviews capture the lived experiences of stakeholders, offering context behind partnership patterns and institutional roles. Quantitative scoring based on the 4I model provides comparative data to highlight stronger and weaker connections. Preliminary results indicate a fragmented business environment. MNEs maintain strong international networks but show weaker local engagement. Local firms often struggle to connect with support institutions and other businesses. Government and academic actors are present, but rarely act as active integrators. These findings suggest the region has yet to achieve institutional maturity. The paper contributes to debates on innovative ecosystems, industrial clusters, business environments, and regional economic policy. It emphasizes the importance of strengthening collaboration, building trust, and designing more inclusive coordination mechanisms. By combining spatial and relational perspectives, the study sheds new light on how fintech clusters emerge and what holds them back.

Literature Review

Industrial clusters are defined by the geographic concentration of interconnected firms, industries, and supporting institutions (M. E. Porter, 1998). These clusters enhance regional competitiveness by creating agglomeration economies that support innovation and productivity (Glaeser et al., 1992). Agglomeration can occur as urbanization economies involving diverse sectors, or as localization economies focused on industry-specific clustering (Porter, 2012; Delgado, Porter, and Stern, 2014). While urbanization enables scale advantages, localization supports deeper knowledge sharing within industries. Scholars refer

to these clusters as “Innovation Hubs” or “Technopoles” to describe their importance in regional development (Ffowcs-Williams, 2012). Porter (2000) highlights that these clusters thrive on both competition and cooperation. The European Union similarly frames clusters as collaborative ecosystems with firms and institutions co-located to exchange knowledge and services. Clusters are generally classified as either traded or local (M. E. Porter, 1998). Traded clusters participate in global markets and contribute significantly to exports, whereas local clusters mainly serve domestic needs and generate employment (Ketels, 2017b; O’Connor, Doyle and Brosnan, 2017). In Ireland, this divide is evident. Local clusters account for 66% of total employment, while traded clusters are responsible for 98% of national exports (O’Connor, Doyle and Brosnan, 2017). This dual function highlights the importance of striking a balance between employment goals and global competitiveness. Cluster studies operate at micro, meso, or macro levels, which allows tailored analysis. Micro-level research focuses on firm interactions, meso-level research explores regional dynamics, and macro-level research supports national strategy (Zhu and Tann, 2005; Byrne, 2016; Walsh, 2020). A multi-scalar approach is essential for understanding how clusters contribute to both local development and national economic policy.

Clusters remain highly relevant in a globalized economy. Porter (1998) emphasized that despite globalization, competitive advantage remains local, driven by specialized knowledge, institutional support, and skilled labour. Policymakers in the EU and the US now rely on cluster data to inform innovation strategies and attract investment (Ketels and Protsiv, 2021). Research shows that well-structured clusters promote innovation, productivity, and improved living standards (Porter, 1998; Porter, 2000; Sölvell, Lindqvist and Ketels, 2003; Ketels and Memedovic, 2008; Delgado, Porter and Stern, 2014; Walsh, 2020). However, Ireland faces challenges in structured cluster development. Despite policy references, the country lacks formal institutions and support mechanisms to sustain clustering at scale (Byrne, 2016; O’Connor, Doyle and Brosnan, 2017; Walsh, 2020). Collaboration among stakeholders is vital for the success of a cluster (Walsh, 2020). Doyle and Fanning (2007) argue that the government should facilitate rather than impose cluster formation. Post-Brexit, Ireland has a unique opportunity to position itself as a fintech hub through EU membership and dual market access. Fintech, as a traded cluster, is central to this strategy. It contributes to GDP and exports, while also attracting foreign investment (O’Connor, Doyle and Brosnan, 2017). Global fintech hubs such as London, Singapore, and New York demonstrate the value of proximity to skilled labour, finance, and regulation (Laidroo and Avarmaa, 2020). Governments play a crucial role in supporting these ecosystems through regulatory sandboxes and co-working spaces. However, clustering brings risks of hyper-competition, rising costs, and congestion, which can undermine its benefits (Wennberg and Lindqvist, 2010). A balanced approach to fintech development is needed to foster inclusive and sustainable growth.

Understanding how fintech clusters develop requires looking beyond spatial proximity. The Triple Helix model offers a lens to examine how industry, academia, and government collaborate to support innovation (Etzkowitz and Leydesdorff, 2000). The model proposes that these actors take on hybrid roles: universities contribute to commercialisation, governments support entrepreneurial ecosystems, and firms engage in research and development (Cai and Etzkowitz, 2020). Institutional integration occurs when these spheres overlap in practice, creating joint platforms such as innovation centres or public-private partnerships (Cai and Etzkowitz, 2020). This integration signals a mature business environment where innovation is systemic, not incidental. The Triple Helix also integrates insights from institutional and network theories. Innovation is understood as non-linear and driven by feedback loops and

collaboration (Leydesdorff and Meyer, 2006). Role hybridisation is central to this dynamic. In emerging business environments, traditional boundaries between institutions may hinder progress. The model suggests that success comes when actors adopt new, complementary roles (Etzkowitz and Dzisah, 2008).

Regional Innovation Systems (RIS) theory complements this by emphasizing the place-based nature of innovation. Innovation is viewed as embedded in regional socio-economic structures, shaped by localized interactions between firms, universities, and governance bodies (Doloreux, 2002). According to (Cooke, Uranga and Etzebarria, 1997), RIS includes knowledge generation and application subsystems, supported by institutional infrastructure. The success of an RIS depends on institutional thickness, proximity, and the strength of learning networks. Borrás and Edquist (2013) highlight the importance of structured interactions for knowledge production, diffusion, and application. Regions with weak coordination suffer from fragmented ecosystems. Asheim, Isaksen and Trippel (2020) stress that RIS must move beyond ideal models, adapting to diverse regional contexts. This is critical for peripheral or less-developed regions. Fernandes *et al.*, (2021) suggest integrating institutional systems, R&D networks, and knowledge flows into policy design. Thus, combining the Triple Helix and RIS frameworks enables a richer understanding of institutional collaboration in regional fintech ecosystems.

To examine relational dynamics within the fintech ecosystem, this study applies the 4I Linkage Model. Hobbs (2010) developed the model to evaluate relationships using four dimensions: intensity, importance, involvement, and investment. The model combines quantitative assessment with qualitative insight, offering a nuanced view of collaboration. It was first used in Ireland's biotech and ICT sectors, where it revealed contrasting patterns between multinationals and local firms (Hobbs, 2010; Byrne, 2016). MNEs often dominate production but lack embeddedness in local networks. SMEs tend to be more locally engaged but have fewer resources. The 4I model captures these differences by focusing on function, frequency, and scope of interaction. It aligns with Porter's cluster theory but addresses the lack of precision in earlier frameworks (Feser and Bergman, 2000). For fintech, it helps in identifying institutional voids or areas of strong coordination. Combining 4I with the Triple Helix and RIS frameworks strengthens the analysis by linking relational strength to systemic integration. This dual lens allows researchers to assess whether fintech firms in the Northwest are building a cohesive business environment or remaining isolated.

The literature suggests that a successful business environment emerges from both top-down support and bottom-up collaboration (Etzkowitz and Dzisah, 2008). In the Irish context, many regions lack institutional integration and suffer from fragmented policy implementation (O'Connor, Doyle and Brosnan, 2017; Walsh, 2020). This can result in clusters that are geographically co-located but lack functional coordination. The Triple Helix framework helps assess maturity by examining hybrid structures and role overlap (Cai and Etzkowitz, 2020). When combined with 4I linkage data, the model enables researchers to evaluate both spatial and relational aspects of the ecosystem. Adding Regional Innovation Systems theory provides additional depth, particularly in assessing the place-based relevance of policy and institutional infrastructure (Cooke, Uranga and Etzebarria, 1997; Doloreux, 2002). The integrated use of Triple Helix, RIS theory, and the 4I model supports a deeper analysis of the fintech cluster in the Northwest City Region. This study contributes to the theoretical understanding of regional innovation and offers practical insights for building more connected, resilient fintech clusters.

Regional Context

The Irish government has identified fintech as a core sector for national economic development. Agencies such as Enterprise Ireland and the IDA support fintech growth by promoting innovation and foreign direct investment (Ireland's Fintech Future, 2023). Low corporate tax rates and tailored regulatory measures, including proposed sandboxes, aim to attract global fintech firms. The Irish fintech industry continues to experience remarkable growth despite global headwinds. The sector attracts around 1 billion euros in investment over past 5 years (Enterprise Ireland, 2025). However, despite favorable conditions, a shortage of skilled professionals and fragmented institutional collaboration pose key barriers. These limitations reflect gaps in systemic coordination among universities, firms, and policymakers, essential elements of innovation ecosystems (Cooke, Uranga and Etxebarria, 1997; Etzkowitz and Leydesdorff, 2000). The Triple Helix model stresses that institutional integration is central to fostering high-value clusters. In this context, role hybridization, such as entrepreneurial universities or policy co-design, would be a crucial factor in Ireland's regional fintech landscape.

The Northwest City Region, which includes Donegal, Derry City, and Strabane, is strategically located at the Ireland-UK border. This area spans 2,394 square miles with a population of 317,000. Educational attainment is relatively high, with over 39% holding Level 3 or higher qualifications (Regional Spatial and Economic Strategy 2040). The region is well-connected digitally, offering direct fiber-optic access to Europe and North America. Urban centers like Derry and Strabane rank highly for remote work potential, reinforcing their suitability for digital industries such as fintech. Despite infrastructural advances, the region has long faced challenges of peripherality and underinvestment. In response, the Irish government has prioritized the area's development through the Regional Spatial and Economic Strategy (RSES) under the National Planning Framework (NPF). The Northwest Strategic Growth Partnership, supported by the International Centre for Local and Regional Development (ICLRD), aims to foster regional collaboration across planning, infrastructure, and economic development. The chambers of commerce in Letterkenny and Derry, representing over 600 businesses, also play a key role in shaping strategy. In parallel, the Northwest Regional Enterprise Plan, led by agencies such as Enterprise Ireland, the Western Development Commission (WDC), and the Industrial Development Agency (IDA), targets talent attraction and retention. However, despite these coordinated efforts, institutional collaboration remains fragmented. Universities and government bodies often contribute to regional goals in parallel rather than through integrated initiatives. The Triple Helix model emphasizes the importance of such integration in fostering innovation ecosystems (Etzkowitz and Leydesdorff, 2000). Understanding how institutional actors align or fail to align in the Northwest is essential for assessing the region's potential as a resilient fintech cluster.

Fintech Environment in the Northwest City Region

The Northwest City Region plays a pivotal role in Ireland's fintech development strategy. Positioned along the Atlantic Economic Corridor, it links key markets across Ireland, the EU, and the UK (InvestDerryStrabane, 2023). Industrial clustering is visible in fintech, Medtech, and ICT sectors, reflecting both sectoral diversification and spatial concentration. According to the Northwest Regional Skills Forum (2018), fintech and ICT are among the fastest-growing sectors in the region. This growth is supported by government policy and global digital trends. However, mere co-location of firms does not ensure innovation. As Porter

(1998) and Ketels (2017) argue, clustering requires not only proximity but also structured inter-firm collaboration. While several fintech firms operate in the region, it is unclear whether this activity constitutes a coherent business environment or a loosely connected aggregation. The Triple Helix framework suggests that innovation emerges when industry, academia, and government develop overlapping roles and shared platforms (Etzkowitz and Dzisah, 2008). At present, such hybrid structures are rare in the Northwest. Institutional voids and coordination failures may hinder deeper integration (Cai and Etzkowitz, 2020).

Ireland's regulatory infrastructure and ICT capabilities offer significant advantages to fintech firms. National and EU-level initiatives, including the Digital Finance Package, promote financial innovation and competitiveness. The COVID-19 pandemic accelerated the shift toward digital financial services, reshaping consumer behavior and firm strategy (Central Bank of Ireland, 2022). These dynamics benefit regional firms but also increase dependence on external demand and capital. Without strong local institutional linkages, regional clusters may remain peripheral within global value chains. This study explores whether the Northwest fintech landscape reflects a genuinely integrated cluster. In doing so, it applies theoretical tools from the Triple Helix and Regional Innovation Systems literature to assess institutional maturity and regional competitiveness.

Components of the Fintech Landscape

The fintech sector in the Northwest City Region consists of a diverse mix of actors. These include traditional financial institutions, consultancies, accounting firms, and specialized fintech startups. Many conventional firms have integrated fintech tools into their operations. For instance, banks and insurers increasingly adopt digital payment systems and automation technologies. Firms like Optum illustrate the sector's evolving boundaries, blending healthcare and financial innovation through tech-enabled services. However, adoption varies across firms, and digital transformation is uneven.

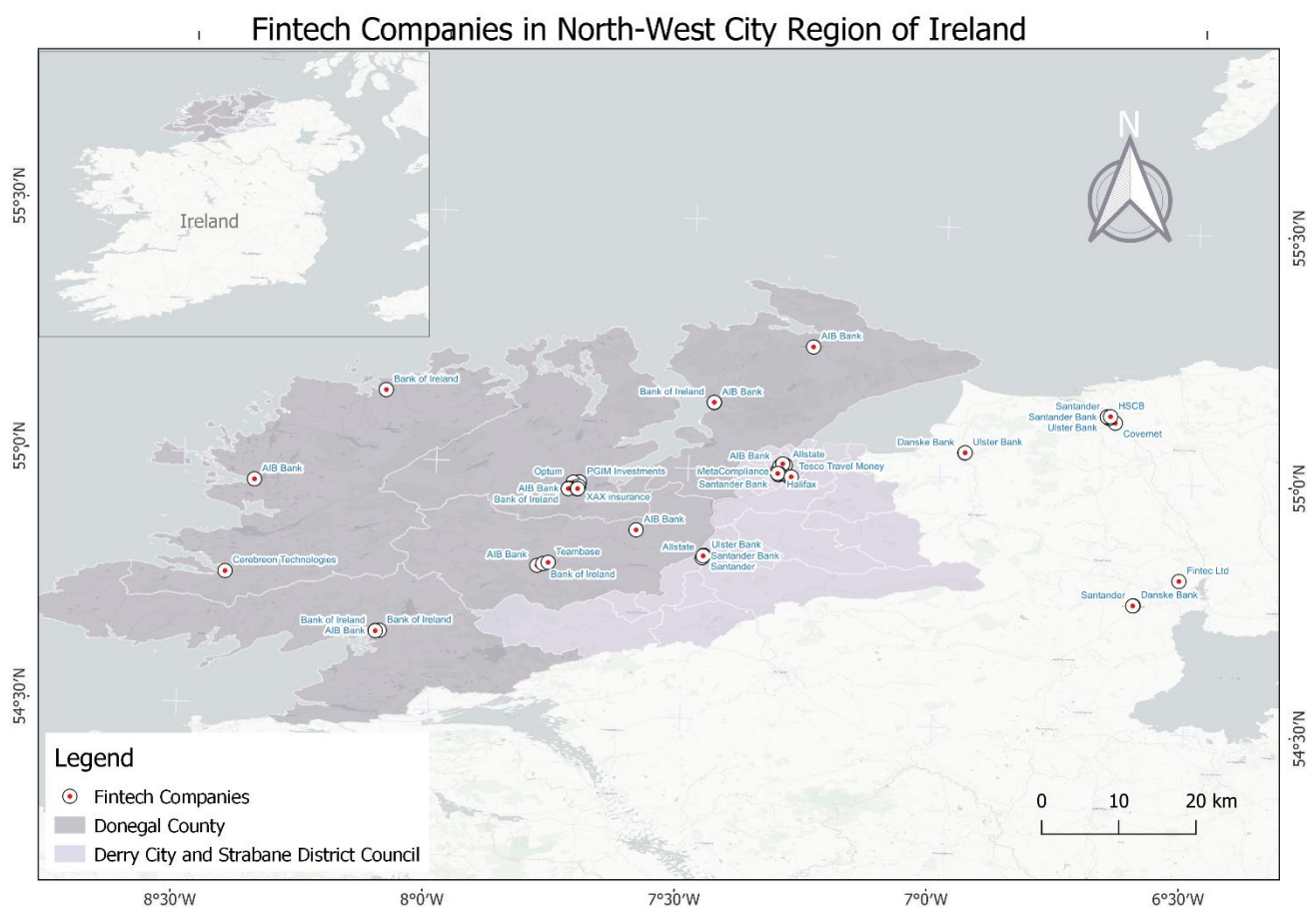
From a theoretical perspective, the presence of diverse firms aligns with Porter's cluster definition spatial concentration of related industries that foster productivity and innovation (M. E. Porter, 1998). However, according to innovation ecosystem theory, such clustering must be supported by functional networks, not just proximity (Asheim, Isaksen and Trippl, 2020). Institutional collaboration becomes essential for knowledge sharing and talent development. Universities in the region, such as Ulster University and Atlantic Technological University, offer fintech-related programs, indicating alignment between educational supply and market demand. Still, empirical data suggest these institutions are not yet fully embedded in the fintech environment. The Triple Helix model argues that effective clusters depend on role hybridization. Universities must act entrepreneurially, while governments facilitate and co-develop with firms (Etzkowitz and Leydesdorff, 2000). Evidence from the region suggests these hybrid roles are limited. Firms remain disconnected from academic research, and government involvement often takes the form of policy support rather than strategic partnership. As a result, the institutional infrastructure for innovation appears fragmented. To assess this further, the study applies the 4I Linkage Model to evaluate the depth and quality of relationships among key actors. This approach helps determine whether the regional fintech sector operates as a system or a set of isolated nodes.

Geographic Distribution of Fintech Firms

Understanding the geographic layout of fintech firms is vital to assessing clustering

dynamics. A map was created to visualize the spatial distribution of financial service providers across the Northwest City Region. The map shows areas of firm concentration and highlights the relative proximity of banks and fintech companies. Spatial data helps identify whether firms are forming dense innovation zones or remain scattered across the region. However, spatial proximity alone does not guarantee collaboration or innovation (Porter, 2000; M. E. Porter, 1998; Porter, 2012). Functional linkages such as partnerships, shared knowledge, and resource flows must accompany spatial clustering to produce innovation benefits. The map also reveals key urban hubs such as Derry and Letterkenny, where fintech activity is most concentrated. These towns host universities, enterprise hubs, and government-supported innovation centres. Yet the presence of these assets does not confirm integration. According to the Regional Innovation Systems perspective, clusters succeed when institutional actors engage in systematic knowledge exchange (Cooke, Uranga and Etzebarria, 1997). Without structured interaction, these actors may operate in silos, reducing the potential for innovation-driven growth.

Figure 1



Methodology

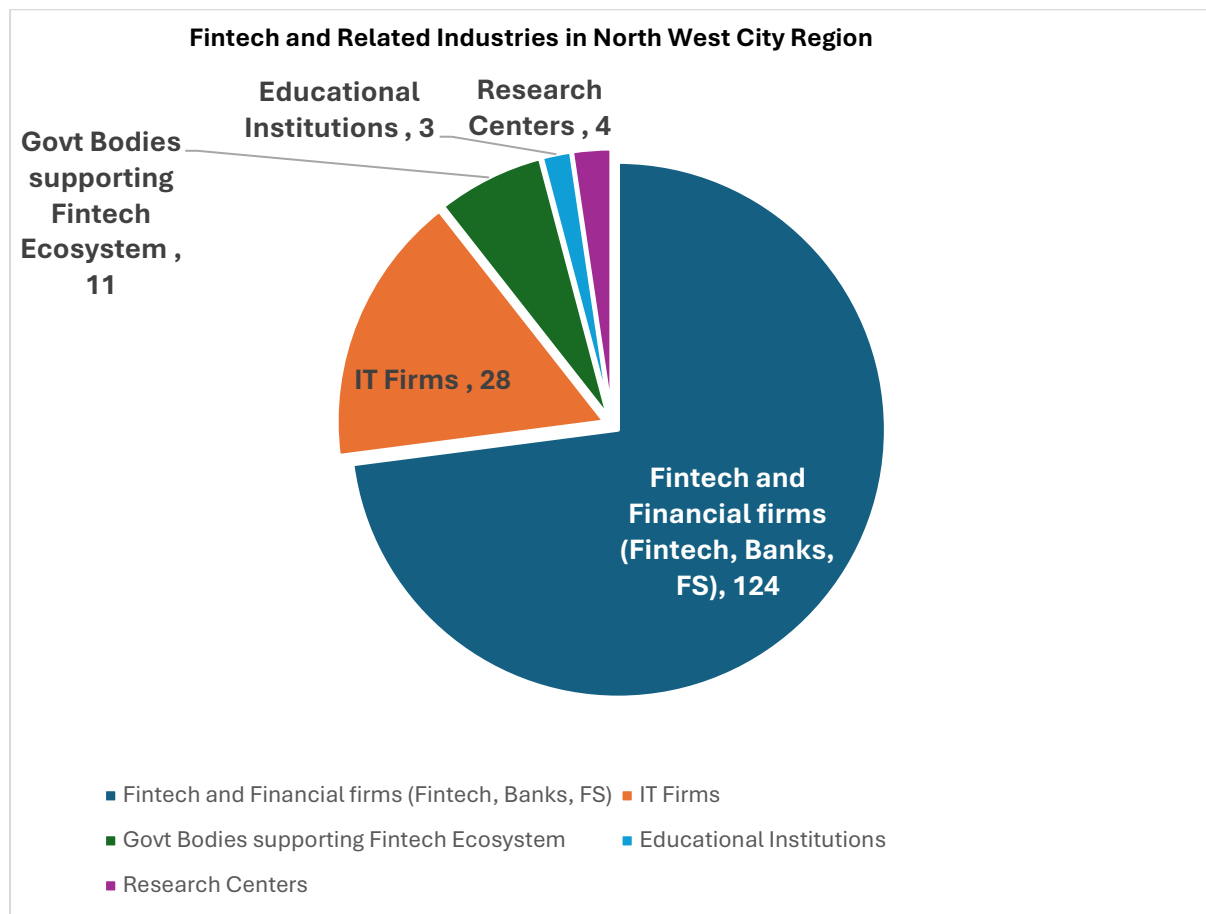
This study adopts a mixed-methods design to examine fintech cluster dynamics in the Northwest City Region of Ireland. Mixed methods are widely used in cluster studies to capture both structural features and contextual dynamics (Brown, 2000; Hobbs, 2010).

Building on the Triple Helix Model (Etzkowitz and Leydesdorff, 2000) and Regional Innovation Systems (Cooke, Uranga and Etzebarria, 1997), the research integrates spatial analysis, stakeholder interviews, and relational assessment to evaluate institutional integration. The methodological approach aligns with innovation ecosystem theory, which highlights the importance of inter-institutional relationships and network quality in fostering regional development (Borrás and Edquist, 2013; Asheim, Isaksen and Trippl, 2020). Spatial mapping supports the identification of firm concentrations, while qualitative interviews reveal patterns of collaboration, power asymmetries, and institutional gaps. The 4I Linkage Model (Hobbs, 2010) operationalizes the concept of relational strength, providing structured metrics across four dimensions: intensity, importance, involvement, and investment. By combining these tools, this study shows to what extent institutional actors in the Northwest City Region of Ireland exhibit integrated collaboration and how these relationships shape fintech cluster development.

Sampling and Data Collection

The research began with desk-based scoping of fintech and related firms in the region. Stakeholder identification was conducted through Google searches, field visits, and institutional directories, the Chamber of Commerce, Letterkenny, and Derry. A working definition of fintech, “technology-enabled innovation in financial services.” (Thakor, 2020) guided inclusion criteria. The sampling strategy followed a purposive and snowball sampling design to ensure relevance and sectoral diversity. Initial contacts were made through local Chambers of Commerce in Letterkenny and Derry, which provided validation and supplementary firm listings. Firms were classified into three categories: fintech firms, IT service providers, and financial services companies. We contacted all the identified fintech firms in the region. We got a final sample of 9 fintech firms that were selected based on relevance to the fintech ecosystem, geographical location within the Northwest City Region, and willingness to participate. To address concerns of representativeness, firms were selected across size categories (MNCs and SMEs). Semi-structured interviews were conducted with the executives of the fintech firm. Each interview lasted between 45 and 75 minutes and was transcribed for thematic coding. This approach provided triangulated insights into the structure and functionality of the regional innovation ecosystem.

Figure 2: Fintech & Related Industries in North West City Region



Geospatial Mapping and Cluster Visualization

To assess spatial patterns in the fintech sector, firm addresses were mapped using Google Maps and Quantum GIS (QGIS). Address data was sourced through verified public profiles and validated during interviews. Python scripts were used to generate geospatial coordinates, which enabled the creation of a regional fintech density map. This spatial visualization identifies areas of clustering, particularly in Letterkenny and Derry/Londonderry, and allows comparison with institutional infrastructure such as universities and enterprise centers. While location quotients were not calculated due to data availability constraints, spatial mapping provided visual context for understanding the degree of co-location among fintech actors. However, as cluster theory suggests, co-location does not necessarily equate to functional integration (Porter, 1998; Giuliani and Pietrobelli, 2011). Therefore, geospatial data were complemented by relational metrics to assess the actual dynamics of collaboration within the ecosystem. These data inform the extent to which spatial clustering is accompanied by systemic institutional linkages, an essential condition for Triple Helix integration and cluster maturity.

Relational Assessment Using the 4I Linkage Model

To measure the strength of inter-institutional relationships, the study applied the 4I Linkage Model developed by Hobbs (2010). This framework assesses linkages along four dimensions: intensity (frequency of interaction), importance (strategic relevance), involvement (collaborative depth), and investment (resource commitment). Each stakeholder was asked to evaluate their key relationships using a Likert scale from 1 to 10 for each of the four dimensions. Linkage scores were summed to produce a total score out of 40, following Hobbs' significance bands: high (30–40), medium (20–30), low (10–20), and negligible (1–10).

Table 1: Linkage Assessment

Significance Band	Score Range	Characteristics
High	30 – 40	Critical connections requiring frequent interactions and strategic importance.
Medium	20 – 30	Relevant but not mission-critical; involve moderate engagement.
Low	10 – 20	Limited contact; potential for future collaboration.
Negligible	1 – 10	Weak or sporadic relationships.

To ensure confidentiality and reduce response burden, respondents were not asked for sensitive financial data. Instead, they were asked to identify cities or institutions where their strongest linkages occurred, allowing a geographic assessment of connectivity. These responses were anonymized and analyzed to identify dominant patterns of interaction and gaps in institutional engagement. The use of the 4I model supports a theoretically grounded, systematic, and replicable method for assessing the depth and quality of relationships within an emerging fintech cluster. It further allows for the identification of power asymmetries and institutional voids, especially between multinational firms and local players.

Analysis of the Fintech Environment

This study examines the fintech ecosystem in the Northwest City Region of Ireland. A total of nine firms participated in interviews conducted between November 2023 and June 2024. Interviews were held online or in person, each lasting 45–70 minutes. Interview data were coded thematically using a structured framework (Braun and Clarke, 2006; Nowell *et al.*, 2017).

Descriptive Analysis of Fintech Companies

Descriptive statistics provide a systematic summary of qualitative data, facilitating deeper thematic exploration (Braun and Clarke, 2006). The participating fintech companies varied in size, geographic origin, and institutional embeddedness. Multinational corporations (MNCs), such as Company 1 (Copenhagen, Denmark), Company 4 (Illinois, USA), and Company 7 (Mumbai, India), have headquarters outside Ireland, demonstrating the presence of international players in the region. In contrast, smaller firms like Company 2 (Belfast), Company 3 (Letterkenny), Company 5 (Letterkenny), Company 6 (Dublin), Company 8 (Online), and Company 9 (Derry) serve local or regional markets and often depend on public and academic support to scale. A comparative assessment of fintech companies reveals

varying levels of local and international collaboration, suggesting different market engagement strategies. The table below summarizes key company characteristics, including headquarters, classification (local or multinational corporation), size, and linkages.

Table 2: Fintech Company Characteristics and Linkages

Company	Headquarters	Type	Size	Local Linkages	International Linkages
Company 1	Copenhagen, Denmark	MNC	>1000	Limited	Global Outlook
Company 2	Belfast, Ireland	Local	>1000	Limited	Global Outlook
Company 3	Letterkenny, Ireland	Local	<50	Limited	Global Outlook
Company 4	Illinois, USA	MNC	800-1000	Limited	Global Outlook
Company 5	Letterkenny, Ireland	Local	<25	Dublin, Cork, Galway, Belfast	UK, Poland
Company 6	Dublin, Ireland	MNC	>1000	Extensive	Global Outlook
Company 7	Mumbai, India	MNC	>1000	Local Linkages	Global Outlook
Company 8	Online	Local	<100	Dublin, Waterford, Cork, Belfast	London, Manchester
Company 9	Derry, Ireland	Local	<50	Local Linkages	UK Mainland

The size of these firms also varies significantly. Companies 1, 2, 4, 6, and 7 have more than 1,000 employees, classifying them as large enterprises under the European Union enterprise categorization. Conversely, Companies 3, 5, 8, and 9 have fewer than 100 employees, placing them in the small enterprise category. Despite spatial proximity among actors, relational asymmetries are evident.

Benchmarking Fintech firms' linkages using the 4I Model

The 4I Linkage Model (Hobbs et al., 2010) was used to evaluate relationships between fintech firms and key institutional actors: government, academia, and industry peers.

Companies rated their relationships based on four key dimensions:

1. Intensity (frequency of engagement)
2. Importance (strategic relevance)
3. Involvement (depth of collaboration)
4. Investment (resource allocation)

Government Agency Linkages: Engagement Across Firm Types

Large MNCs such as Company 4 and Company 6 scored high (35/40), reflecting frequent interaction, strategic alignment, and mutual investment. These firms benefit from embedded relationships with IDA Ireland and Invest NI, consistent with their greater resource capacity and political visibility. Company 4 stated: *“We can lift the phone up and get what we need... at very short notice.”* This quote validates their high scores in intensity and involvement,

suggesting a responsive and accessible government interface for well-established firms (Di Castri and Plaitakis, 2018). In contrast, smaller firms like Company 5 (15/40) and Company 3 (22/40) reported fragmented engagement. Lower scores reflect inconsistent outreach, weak follow-up, and limited participation in co-designed initiatives. This aligns with the concept of institutional voids (Borrás and Edquist, 2013), where policy tools fail to connect with grassroots firms. Company 5 noted, *“There's no continuation of engagement... more opportunity to reach out would be beneficial.”* This aligns with their low ‘intensity’ and ‘involvement’ scores, suggesting that smaller firms lack persistent government touchpoints. Interestingly, Company 2, although locally based and large, scored well (32/40) due to its proximity to government funding streams and regulatory resources. This suggests that geographic access and organizational scale intersect to determine engagement quality, supporting findings from RIS theory (Cooke, Uranga and Etxebarria, 1997).

Table 4: Government Agency Linkages

Company	Intensity	Importance	Involvement	Investment	Total Score
Company 1	5	5	5	5	20
Company 2	9	8	8	7	32
Company 3	7	7	4	4	22
Company 4	8	9	9	9	35
Company 5	5	5	3	2	15
Company 6	9	9	9	8	35
Company 7	7	8	8	8	31
Company 8	5	5	5	5	20
Company 9	4	7	6	6	23

Academic Institution Linkages: Talent Alignment and Co-Creation

Academic linkages were polarized. Company 1 (40/40) and Company 2 (37/40) rated universities as critical partners, reflecting structured graduate recruitment and involvement in curriculum design. According to Company 1, *“We have built a long-term partnership with the local university for both curriculum input and graduate recruitment. They even redesigned parts of a module based on our feedback.”* This suggests active role hybridization (Etzkowitz and Dzisah, 2008), where universities act as labor market enablers. However, the depth of research collaboration remains limited. Firms like Company 6 (19/40) and Company 8 (16/40) noted limited access to applied R&D or technology transfer services. Even those with moderate scores (e.g., Company 3 (24/40)) emphasized talent acquisition over innovation co-creation. According to Company 6, *“We tried reaching out for some R&D collaboration, but there wasn't much appetite or clear pathway for that kind of partnership. We've shifted to internal innovation.”* A quote from company 8 also shows a weak

relationship: *“The university offers good graduates, but that’s about it. There’s no engagement beyond hiring. We wouldn’t even know who to talk to about joint projects.”* This reinforces a pattern of thin institutional thickness (Asheim, Isaksen and Trippl, 2020), where basic engagement exists without systemic knowledge exchange.

Table 5: Academic Institution Linkages

Companies	Intensity	Importance	Involvement	Investment	Total Score
Company 1	10	10	10	10	40
Company 2	9	9	10	9	37
Company 3	4	8	6	6	24
Company 4	5	8	6	6	25
Company 5	6	6	6	5	23
Company 6	5	5	4	5	19
Company 7	8	8	8	8	32
Company 8	4	4	4	4	16
Company 9	4	5	4	4	17

Industry Peer Linkages: High Functional Value but Spatial Disconnection

Peer linkages received the highest scores across the board, with Company 1 (40/40), Company 5 (35/40), and Company 7 (36/40) reporting strong customer or supplier relationships. These ties are often operational rather than collaborative, focused on service delivery and platform integration. Despite high scores, these connections are often global. For example, Company 1’s links are with international partners: *“We have a client base of 15 global investment banks... most of our interactions are with financial institutions in Europe and the US.”* It shows a high peer linkage score driven by international, not local, relationships. They are operationally strong but spatially distant. while Company 2 reported no peer linkages at all. *“We don’t collaborate with any other fintech companies in the region. Our focus is on internal development and compliance services.”* This reflects the dual role of agglomeration. while spatial clustering exists, functional interdependence is selective and externally focused (Giuliani and Pietrobelli, 2011).

Local firms like Company 3 (34/40) and Company 9 (25/40) reported stronger regional linkages, but still rely on one-way information flow rather than co-development. According to Company 3, *“We share some clients and occasionally refer work to other small providers in the region, but it’s not structured collaboration. Mostly one-offs.”* It is based on local referrals, not co-development. Suggests limited depth despite regional presence. According to Company 9, *“We have ongoing partnerships with local accountancy and legal firms, but these are mostly transactional. We don’t do shared projects.”* They have regionally rooted peer ties that are functional but shallow in collaboration depth. This underscores the missing

middle in network structure, where firms operate in silos despite potential for synergy (Ketels, 2017).

Table 6: Industry Peer Linkages

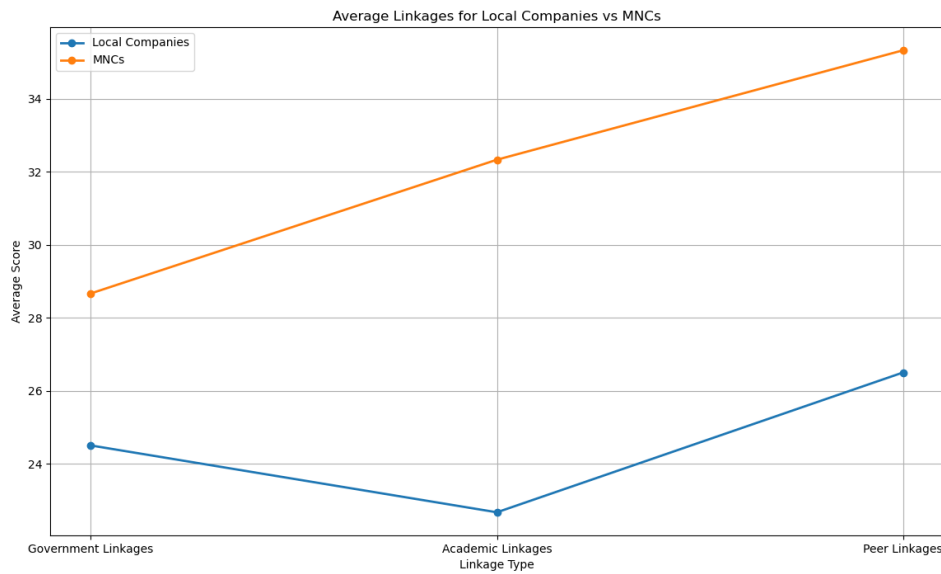
Companies	Intensity	Importance	Involvement	Investment	Total Score
Company 1	10	10	10	10	40
Company 2	0	0		0	0
Company 3	8	10	8	8	34
Company 4	7	7	8	8	30
Company 5	8	9	9	9	35
Company 6	8	9	8	8	33
Company 7	9	9	9	9	36
Company 8	8	8	8	8	32
Company 9	5	7	6	7	25

The following findings triangulate quantitative scores with qualitative insights, revealing patterns in collaboration strength, institutional gaps, and ecosystem maturity.

Comparative Performance

Figure 6 illustrates the comparative strength of linkages between local fintech companies and multinational corporations (MNCs) across the three Triple Helix actors: academic institutions, government bodies, and industry peers. MNCs consistently report stronger linkages in all categories, reflecting their broader resource base, mature organizational structures, and globally integrated networks. In contrast, local firms, particularly SMEs, display relatively weaker ties, particularly with academic institutions, underscoring a structural limitation often seen in less mature Regional Innovation Systems (RIS), where institutional and organizational “thinness” constrains collaboration (Asheim, Isaksen and Trippel, 2020).

Figure 6: Local companies vs MNCs across all the linkages



Although some indigenous MNCs and high-growth firms perform better in certain linkage types, their engagement remains uneven, especially at the local level. Peer networks, which are crucial for knowledge spillovers and collaborative learning within the RIS framework, appear underdeveloped. This suggests a need for more targeted mechanisms to foster institutional thickness and horizontal networking within the local fintech cluster. It is essential to note that the linkage scores depicted do not quantify the number of relationships but instead reflect their qualitative strength, as perceived by the participating firms. These ratings were obtained through the 4I linkage framework, capturing dimensions such as intensity, involvement, and mission-critical relevance. Follow-up interview questions probed participants' justifications for these ratings and invited suggestions on how each type of relationship, academic, governmental, and industrial, could be improved. These responses revealed actionable insights into the structural gaps and strategic opportunities necessary to cultivate a more cohesive and innovation-friendly fintech environment in the Northwest city region.

Conclusion

This study examined the fintech cluster in Ireland's Northwest City Region using the Triple Helix model, Regional Innovation Systems theory, and the 4I Linkage Model. The findings reveal a fragmented business environment for fintech clustering. While the region benefits from strong digital infrastructure and international connections, local collaboration remains weak. Multinational firms show high engagement with global peers and public agencies but rarely interact locally. Smaller firms struggle to access institutional support and often lack structured partnerships. Academic institutions provide talent but are rarely involved in joint research or co-development. Government agencies engage more with larger firms, leaving SMEs under-supported. The 4I linkage scores confirm this imbalance, highlighting low intensity and investment in many relationships. Peer linkages are operational but not collaborative. Spatial clustering exists, but functional integration is limited. Without stronger local ties, the region risks becoming a transit zone for external actors rather than a self-sustaining innovation hub. To grow as a resilient fintech cluster, the region needs targeted

policies to strengthen trust, build inclusive platforms, and support co-designed initiatives. A more mature Triple Helix system marked by shared goals and overlapping roles is essential.

Future research should focus on tracking change over time and developing tailored interventions. Overall, this study underscores that presence alone does not create innovation; only strong relationships do. Future research should assess changes over time. Longitudinal studies can show if interventions improve collaboration. Comparative studies across other Irish regions may also reveal best practices. Overall, the Northwest has potential, but it must move from co-location to coordination. Only then can it become a mature, innovation-led fintech cluster.

References

- Asheim, B.T., Isaksen, A. and Trippel, M. (2020) 'The role of the Regional Innovation System approach in contemporary regional policy: is it still relevant in a globalised world?', in *Regions and innovation policies in Europe*. Edward Elgar Publishing, pp. 12–29. Available at: <https://www.elgaronline.com/downloadpdf/edcollchap/edcoll/9781789904154/9781789904154.00006.pdf> (Accessed: 26 June 2025).
- Borrás, S. and Edquist, C. (2013) 'The choice of innovation policy instruments', *Technological forecasting and social change*, 80(8), pp. 1513–1522. Available at: <https://www.sciencedirect.com/science/article/pii/S0040162513000504> (Accessed: 27 June 2025).
- Braun, V. and Clarke, V. (2006) 'Using thematic analysis in psychology', *Qualitative research in psychology*, 3(2), pp. 77–101.
- Brown, R. (2000) *Cluster dynamics in theory and practice with application to Scotland*. CiteSeer. Available at: <https://citeseerx.ist.psu.edu/document?repid=rep1&type=pdf&doi=7b85a909b1583a71f94b03ef7f5638bc337a7c25> (Accessed: 18 February 2024).
- Byrne, E.M. (2016) 'Incorporating Network Theory and Visualisation into Cluster Analysis: A Hybrid Methodology Applied to European ICT Clusters'.
- Cai, Y. and Etzkowitz, H. (2020) 'Theorizing the Triple Helix model: Past, present, and future', *Triple Helix*, 7(2–3), pp. 189–226. Available at: https://brill.com/view/journals/thj/7/2-3/article-p189_4.xml (Accessed: 26 June 2025).
- Cooke, P., Uranga, M.G. and Etxebarria, G. (1997) 'Regional innovation systems: Institutional and organisational dimensions', *Research policy*, 26(4–5), pp. 475–491. Available at: <https://www.sciencedirect.com/science/article/pii/S0048733397000255> (Accessed: 26 June 2025).
- Delgado, M., Porter, M.E. and Stern, S. (2014) 'Clusters, convergence, and economic performance', *Research Policy*, 43(10), pp. 1785–1799. Available at: <https://doi.org/10.1016/j.respol.2014.05.007>.
- Di Castri, S. and Plaitakis, A. (2018) 'Going beyond regulatory sandboxes to enable FinTech innovation in emerging markets', *Available at SSRN 3059309* [Preprint]. Available at: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3059309 (Accessed: 24 June 2024).
- Doloreux, D. (2002) 'What we should know about regional systems of innovation', *Technology in society*, 24(3), pp. 243–263. Available at: <https://www.sciencedirect.com/science/article/pii/S0160791X02000076> (Accessed: 26 June 2025).
- Doyle, E. and Fanning, C. (no date) 'THE ROLE FOR CLUSTERS IN IRISH ECONOMIC DEVELOPMENT POLICY', p. 15.
- Etzkowitz, H. and Dzisah, J. (2008) 'Rethinking development: circulation in the triple helix', *Technology Analysis & Strategic Management*, 20(6), pp. 653–666. Available at: <https://doi.org/10.1080/09537320802426309>.

- Etzkowitz, H. and Leydesdorff, L. (2000) 'The dynamics of innovation: from National Systems and "Mode 2" to a Triple Helix of university–industry–government relations', *Research policy*, 29(2), pp. 109–123. Available at: <https://www.sciencedirect.com/science/article/pii/S0048733399000554> (Accessed: 26 June 2025).
- Fernandes, C. *et al.* (2021) 'Regional innovation systems: what can we learn from 25 years of scientific achievements?', *Regional Studies*, 55(3), pp. 377–389. Available at: <https://doi.org/10.1080/00343404.2020.1782878>.
- Feser, E.J. and Bergman, E.M. (2000) 'National Industry Cluster Templates: A Framework for Applied Regional Cluster Analysis', *Regional Studies*, 34(1), pp. 1–19. Available at: <https://doi.org/10.1080/00343400050005844>.
- Ffowcs-Williams, I. (2012) *Cluster development: the go-to handbook : building competitiveness through smart specialisation*. Nelson, N.Z.: Cluster Navigators.
- Giuliani, E. and Pietrobelli, C. (2011) 'Social network analysis methodologies for the evaluation of cluster development programs'. Available at: https://www.academia.edu/download/47241060/Social_Network_Analysis_Methodologies_fo20160714-14762-1syebpp.pdf (Accessed: 18 February 2024).
- Glaeser, E.L. *et al.* (1992) 'Growth in cities', *Journal of political economy*, 100(6), pp. 1126–1152.
- Hobbs, J. (2010a) 'A framework for analysis of spatial specialisations of industry'. Available at: <https://sword.cit.ie/allthe/636/> (Accessed: 18 February 2024).
- Hobbs, J. (2010b) 'A framework for analysis of spatial specialisations of industry'. Available at: <https://sword.cit.ie/allthe/636/> (Accessed: 26 June 2025).
- Ketels, C. (2017a) 'Cluster mapping as a tool for development', *Institute for Strategy and Competitiveness-Harvard Business School: Boston, MA, USA*, 52. Available at: https://www.researchgate.net/profile/Christian-Ketels/publication/320372104_Cluster_Mapping_as_a_Tool_for_Development/links/59e06be80f7e9bc51264c408/Cluster-Mapping-as-a-Tool-for-Development.pdf (Accessed: 4 May 2025).
- Ketels, C. (2017b) 'Cluster Mapping as a Tool for Development', p. 52.
- Ketels, C. and Protsiv, S. (2021) 'Cluster presence and economic performance: a new look based on European data', *Regional Studies*, 55(2), pp. 208–220. Available at: <https://doi.org/10.1080/00343404.2020.1792435>.
- Ketels, C.H.M. and Memedovic, O. (2008) 'From clusters to cluster-based economic development', *International Journal of Technological Learning, Innovation and Development*, 1(3), p. 375. Available at: <https://doi.org/10.1504/IJTLID.2008.019979>.
- Laidroo, L. and Avarmaa, M. (2020) 'The role of location in FinTech formation', *Entrepreneurship & Regional Development*, 32(7–8), pp. 555–572. Available at: <https://doi.org/10.1080/08985626.2019.1675777>.

Leydesdorff, L. and Meyer, M. (2006) 'Triple Helix indicators of knowledge-based innovation systems: Introduction to the special issue', *Research policy*, 35(10), pp. 1441–1449. Available at: <https://www.sciencedirect.com/science/article/pii/S0048733306001508> (Accessed: 26 June 2025).

Nowell, L.S. *et al.* (2017) 'Thematic Analysis: Striving to Meet the Trustworthiness Criteria', *International Journal of Qualitative Methods*, 16(1), p. 160940691773384. Available at: <https://doi.org/10.1177/1609406917733847>.

O'Connor, S., Doyle, E. and Brosnan, S. (2017) 'Clustering in Ireland: development cycle considerations', *Regional Studies, Regional Science*, 4(1), pp. 263–283. Available at: <https://doi.org/10.1080/21681376.2017.1402361>.

Porter, M. (1998) 'Clusters and competitiveness', *Harvard Business Review*, 76(6), pp. 140–147.

Porter, M.E. (1998) 'The Adam Smith Address: Location, Clusters, and the □New□ Microeconomics of Competition'.

Porter, M.E. (2000) 'Location, Competition, and Economic Development: Local Clusters in a Global Economy', *Economic Development Quarterly*, 14(1), pp. 15–34. Available at: <https://doi.org/10.1177/089124240001400105>.

Porter, M.E. (2012) 'The economic performance of regions', in *Regional competitiveness*. Routledge, pp. 131–160.

Sölvell, Ö., Lindqvist, G. and Ketels, C.H.M. (2003) *The cluster initiative greenbook*. 1st ed. Sweden: Ivory Tower.

Thakor, A.V. (2020) 'Fintech and banking: What do we know?', *Journal of Financial Intermediation*, 41, p. 100833.

Walsh, B.M. (2020) 'A V-LINC Analysis of Agrifood and Tourism Specialisations in West Cork: Analysis, Impressions and Policies for Future Growth', *A V* [Preprint].

Wennberg, K. and Lindqvist, G. (2010) 'The effect of clusters on the survival and performance of new firms', *Small Business Economics*, 34, pp. 221–241.

Zhu, D. and Tann, J. (2005) 'A regional innovation system in a small-sized region: A clustering model in Zhongguancun Science Park', *Technology Analysis & Strategic Management*, 17(3), pp. 375–390.

<https://www.ibec.ie/connect-and-learn/industries/financial-services-leasing-and-professional-services/financial-services-ireland/digital-finance/irelands-fintech-future>

<https://www.enterprise-ireland.com/en/news/irish-fintech-industry-continues-to-experience-remarkable-growth-defying-global-trends->

<https://www.nwra.ie/wp-content/uploads/2020/01/adpoted-rses.pdf>

<https://www.derrystrobane.com/business/investment>

<https://www.gov.ie/en/department-of-further-and-higher-education-research-innovation-and-science/services/north-west-regional-skills-forum/>

[**https://www.centralbank.ie/publication/corporate-reports/central-bank-annual-report-and-annual-performance-statement-2022**](https://www.centralbank.ie/publication/corporate-reports/central-bank-annual-report-and-annual-performance-statement-2022)